Vol. 7, No. 5 May, 1952

AGRICULTURAL CHEMICALS

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NACA Meets in California

•

Story of CMU Herbicides

•

National Fertilizer Association to Meet

•

Chemical Control of Grasshoppers

•

Plant Food Council Meeting Program

•

Agricultural Research "Pots & Tools" Battle

•

Should Pesticides and Fertilizers Be Taxed?

•

Ryania Insecticides Against Corn Borer

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Improved Emulsifiable Concentrates

make a difference where it counts!

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4. Its universality saves time, trouble and money in ordering, stocking, scheduling and handling.

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Dept. P, 210 West Washington Square, Phila. 5, Pa.

YOUR PROBLEMS DISCUSSED. Various aspects of pesticide processing are discussed in Attaclay Pesticide Digest. A brief note will bring back copies while they last, and future issues as published. Write today.

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Equipment and plot layout for testing fungicides in Florida. (See Dr. Townsend's article on page 77) Note efficient coverage of the chemical in plant rows. By experimenting in Florida, more than one field test can be made each year.

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MAY 1952

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A Monthly Magazine For the Trade

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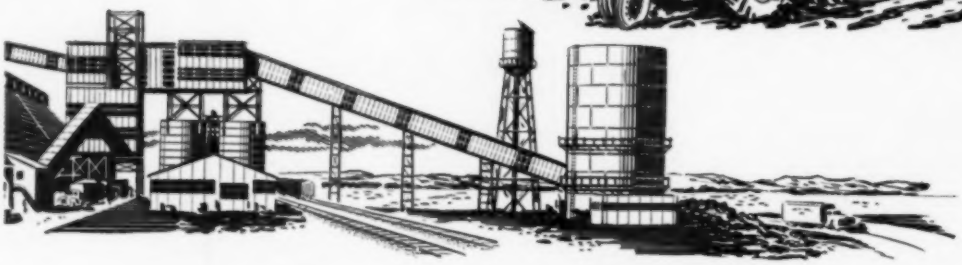

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a poster to hang on your wall

Monsanto has published a poster, entitled "Handle Parathion Safely," that should hang on the walls of every formulator, user, in fact anyone who handles this modern insecticide. It is being offered as part of Monsanto's program of furthering and expanding the use of agricultural chemicals by encouraging their *safe handling*. You can have a copy of this poster *free*. Request one by letter, card or coupon.

Niran, Monsanto's parathion, a relatively new, highly toxic insecticide, can be handled as safely as any of the older pesticides, if instructions on the poster are followed.

Niran (di-ethyl p-nitrophenyl thionophosphate) has been proved effective in four years of use in combating aphids, mites, caterpillars, beetles and scales. It can be applied as sprays, dusts, dust suspensions or aerosols.

If parathion is in your line of agricultural chemicals, we have two suggestions for you. First, mail the coupon for a copy of the new Monsanto poster and for literature on Niran. Second, contact the nearest Monsanto Sales Office and make arrangements for your 1952 Niran while supplies are available. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

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NIRAN
(parathion)

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DUST CONCENTRATE

TRI-EXCEL

contains rotenone, pyrethrins and the synergist, n-propyl isome. The combination is more effective than any of these ingredients used alone.

TRI-EXCEL

has proved to be particularly outstanding for Mexican bean beetle control. It has proved excellent for the control of a large variety of truck crop pests.

TRI-EXCEL

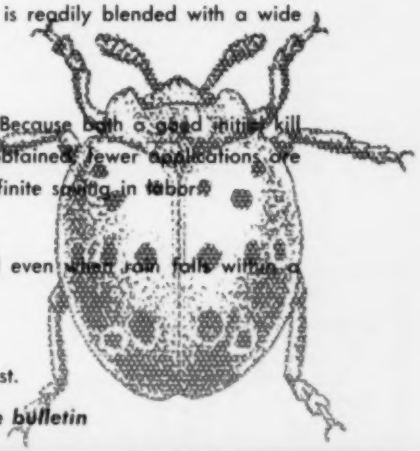
offers definite advantages: safety, convenience, economy, fast action, high kill and residual control.

SAFETY

Tri-Excel is safe for the custom dust mixers and the growers. It leaves no hazardous residue on the plants.

CONVENIENCE

Tri-Excel is easy to use. It is free-flowing and is readily blended with a wide range of diluents.



ECONOMY

Tri-Excel makes a finished dust at a low cost. Because both a good initial kill and a definite degree of residual control are obtained, fewer applications are required during the season. This produces a definite saving in labor.

FAST ACTION

Tri-Excel acts immediately, assuring a high kill even when rain falls within a few hours of application.

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Tri-Excel lasts longer than straight rotenone dust.

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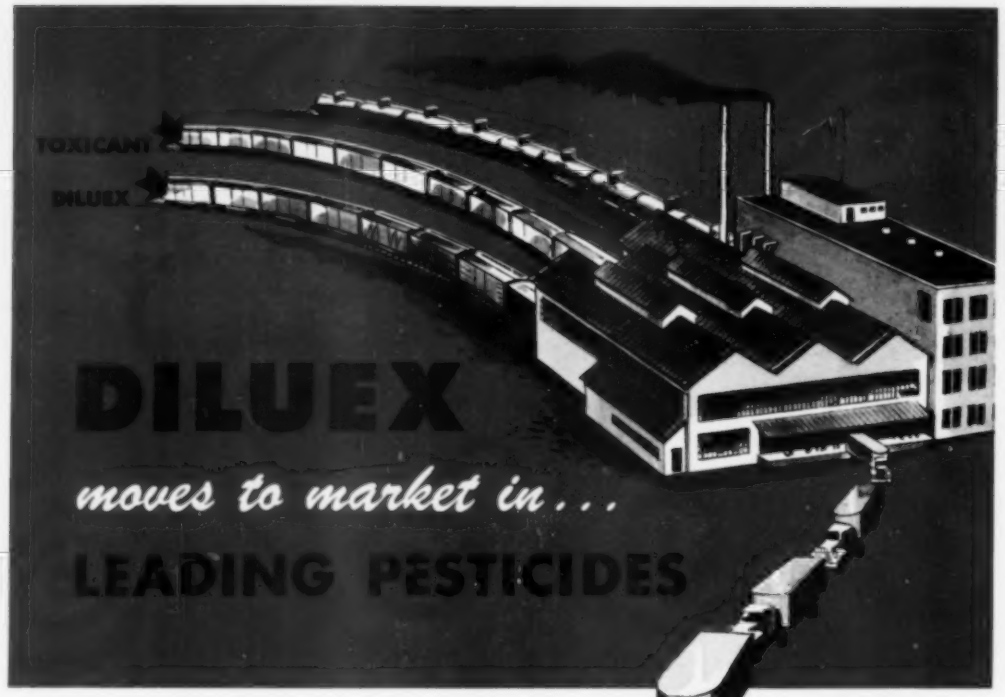

On the basis of technical study and practical experience, Floridin products, extracted and specially processed at Quincy and Jamieson, Florida, are coming into more and more general use in the agricultural chemical industry.

Are you impregnating toxaphene—chlordane—aldrin—parathion—any liquid toxicant?

Are you milling DDT, BHC, or other organics?

Formulating blended dusts?

For any of these processes, it will be worth your while to learn about DILUEX and DILUEX-A.

As grinding aids, adsorbent concentrate bases, and dust conditioners for the most exacting uses of the industry, Floridin products have won a leading place. The demand for DILUEX and DILUEX-A, increasing steadily for many years, has recently grown to multiplied tonnage. Production facilities have been enlarged accordingly, and shipments are being made without delay, by train and truck from two Floridin plants at Quincy and Jamieson, Florida. Correspondence is invited.

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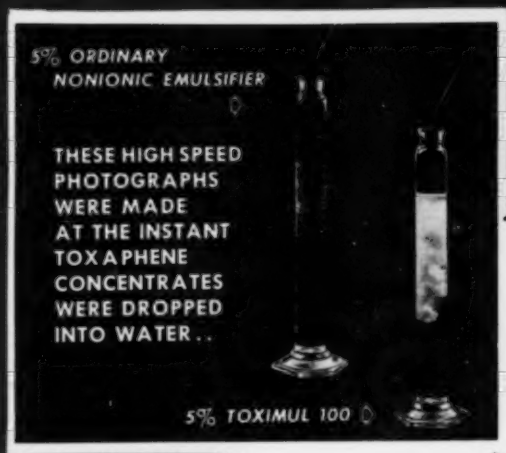
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NINOL TOXIMUL

a balanced anionic emulsifier for agricultural insecticides

TOXIMUL is the family name of Ninol Laboratories' new series of Emulsifiers, designed to improve performance and reduce costs of biocidal spray concentrates. Various members of the series have been developed for use with different types of insecticides such as Toxaphene, Chlordane, DDT, etc.

TOXIMUL 100, for example, features *spontaneous dispersion* when used in Toxaphene emulsion concentrates. When added to water of any hardness, concentrates containing TOXIMUL 100 form stable emulsions with a minimum of agitation. Such concentrates are therefore ideal for general agricultural use, and particularly where agitation conditions are poor . . . as in aeroplane sprayers, knapsack tanks and cattle dips.

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Gentlemen:

Please send me sample and further information about TOXIMUL emulsifiers. Our major product type is:

☐ Toxaphene ☐ Chlordane ☐ DDT
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WHY METHOXYCHLOR

an insecticide developed by Du Pont research has gained outstanding recognition

FOR SAFETY and EFFECTIVENESS

Each year, new organic insecticides are being offered to farmers. Though none has attained all the qualities of an ideal insecticide, as each one becomes known for its special merits, a pattern for its use develops.

So it has been with methoxychlor. Ten years ago Du Pont undertook a pioneering job: To develop an effective new residual insecticide that would be safe on sensitive crops, and low in toxic hazard to humans and warm-blooded animals to permit its use close to harvest.

Methoxychlor has now been in use for several seasons, and is recognized not only for its effective control of many insects, but also for its unusually low order of toxicity to plants and to warm-blooded animals.

This outstanding combination of qualities makes methoxychlor one of the most versatile insect killers ever discovered, as indicated by the accompanying list of uses.

Representative Recommendations of Official Experiment Stations for Use of Methoxychlor:

VEGETABLES

ALABAMA: Tomatoes—fruit worm.

COLORADO: Beans—Mexican bean bettle, flea beetle.
Cucumbers—striped cucumber beetle.

CONNECTICUT: Beans—Mexican bean beetle, leafhoppers.
Cucumbers, Squash, Melons—striped cucumber beetle.

DELAWARE: Cucumbers—striped and spotted cucumber beetles, squash vine borer.

FLORIDA: Beans—Mexican bean beetle.

INDIANA: Beans—Mexican bean beetle.
Cucumbers, melons—striped cucumber beetle.

KENTUCKY: Cabbage, Broccoli, Kohlrabi, Cauliflower, Collards—cabbage worms.
Garden plants—flea beetles, leafhoppers.

MASSACHUSETTS: Beans—Mexican bean beetle.
Cucumbers, melons—cucumber beetles.
Gardens and lawns—Japanese beetle.
Tomatoes—flea beetles.

MICHIGAN: Beans—green clover worm, leafhoppers, Mexican bean beetle.
Cucumbers, Squash, Melons—striped and spotted cucumber beetles.
Tomatoes—flea beetles.

MINNESOTA: Asparagus—asparagus beetle.
Beets—webworms.
Broccoli, Brussels sprouts, Cabbage, Cauliflower, Rutabaga, Turnips—cabbage maggots, cabbage worms.

MISSISSIPPI: Beans—bean leaf beetle, Mexican bean beetle, weevils (field or storage).
Cabbage, Mustard, Turnips—cabbage worms, flea beetles.
Corn—corn earworm.
Cucumbers, Cantaloupes, Squash—striped and 12-spotted cucumber beetles, pickle worms, melon worms.
Eggplant—flea beetles, tomato hornworm, Colorado potato beetle.
General vegetables—cutworm, blister beetle, vegetable weevil.
Peas—weevils (field or storage).
Potatoes—flea beetles, Colorado potato beetle.
Tomatoes—tomato fruit worm, Colorado potato beetle, flea beetles, tomato hornworm.

MISSOURI: Garden Insect Pests—Mexican bean beetle, bean leaf beetle, flea beetles, cabbage worms, blister beetles, Colorado potato beetle, pests of watermelons, cucumbers, squash, cantaloupes, pumpkins.

NEBRASKA: Beans—bean leaf beetle.
Cabbage—flea beetles, cabbage looper, cabbage worm, Harlequin bug.
Cucurbits—spotted and striped cucumber beetles, squash vine borer, squash bug.

NEW JERSEY: Beans (snap and lima)—Mexican bean beetle, leafhoppers, corn earworm.
Cucumbers, Squash, Melons—striped and 12-spotted cucumber beetles, squash vine borer.

NEW YORK: Cabbage—cabbage worms, thrips, flea beetles, cucumbers, melons—striped cucumber beetle.
Squash—squash vine borer.

NORTH CAROLINA: Beans—Mexican bean beetle, bean leaf beetle, leafhoppers, spotted cucumber beetles.

VEGETABLES (cont.)

	Cabbage and Related Crops—flea beetles, vegetable weevils, cabbage worms.
	Cantaloupes, Cucumbers, Squash—striped and spotted cucumber beetles, pickle worms, melon worms.
NORTH DAKOTA:	Beans—bean beetles.
	Beets, Lettuce, Muskmelon, Tomatoes—leafhoppers.
	Cucumbers—cucumber beetle, squash—squash vine borer.
OHIO:	Beans—Mexican bean beetle, leafhoppers.
	Cabbage—cabbage worms.
	Cucumbers, Melons, Squash, Watermelons.
	Pumpkins—cucumber beetles, vine borer, pickleworms.
	Tomatoes—Colorado potato beetle, flea beetles.
OREGON:	Asparagus—asparagus beetle.
	Beans—western spotted cucumber beetle.
	Beets—flea beetles, leaf beetle.
	Cabbage—cabbage worm, diamond-back moth, flea beetles.
	Cucumbers, Melons, Squash, Pumpkins—western striped cucumber beetle, western spotted cucumber beetle.
	Eggplant—flea beetles, western spotted cucumber beetle.
	Horseradish—diamond-back moth.
	Peas—pea weevil.
	Potatoes—Colorado potato beetle.
	Radishes—flea beetle.
	Spinach—western spotted cucumber beetle.
	Tomatoes—flea beetle.
PENNSYLVANIA:	Vegetables—cucumber beetle, bean beetle, leafhoppers, aquash vine borer, flea beetles.
RHODE ISLAND:	Asparagus—asparagus beetle.
	Beans (pole, bush, lima)—Mexican bean beetle, leafhoppers, Japanese beetle.
	Cabbage, Broccoli, Brussels Sprouts, Cauliflower—cabbage worms.
	Carrots—yellows disease by control of leafhoppers.
	Cucumbers, Melons—striped and spotted cucumber beetles, squash vine borer, flea beetles.
	Tomatoes—flea beetles, potato beetle.
	Eggplant, Pepper—flea beetle, tomato worms, blister beetles.
SOUTH CAROLINA:	Potatoes—potato tuber worm.
TENNESSEE:	Vegetables—cabbage worms, "potato insects," flea beetles.
TEXAS:	Cantaloupes, Cucumbers, Squash, Watermelons and all Cucurbits—melon worms, cucumber beetles.
	Cauliflower, Broccoli, Cabbage—cabbage worms.
	Mustard—loopers.
	Spinach—flea beetles, loopers, worms.
	Tomatoes—suck flies.
VIRGINIA:	Beans—Mexican bean beetle.
WEST VIRGINIA:	Beans—bean leafhopper.
	Cabbage, Cauliflower, Broccoli—cabbage worm, Harlequin bug.
	Cucumbers, Squash, Melons—cucumber beetles, pickle worms, squash bugs, squash vine borer.
	Eggplant, Tomatoes—flea beetles.
	Spinach, Lettuce, other greens—flea beetle, leaf miner.
WISCONSIN:	Cabbage—imported cabbage worm, cabbage looper.
	Cucumbers—cucumber beetles, squash-borer.
	Lettuce—6-spotted leafhopper.

FRUIT

ALABAMA:	Peaches—plum curculio.
CALIFORNIA:	Apricots—codling moth.
COLORADO:	Sour cherries—cherry fruit worm.
CONNECTICUT:	Apples—tent caterpillar, canker worm, bud moth, sawfly, plum curculio, apple maggot.
	Peaches—plant bug, plum curculio.
IDAHO:	Cherries—cherry fruit fly.
MARYLAND:	Peaches—Japanese beetle.
MICHIGAN:	Cherries—plum curculio.
	Blueberries—blueberry fruit worm.
MINNESOTA:	Strawberries—strawberry weevil, leafroller.
NEW HAMPSHIRE:	Apples—plum curculio.
NEW YORK:	Apples—plum curculio, apple maggot.
	Peaches, Plums, Prunes—plum curculio.
OREGON:	Cherries—cherry fruit fly.
	Strawberries—meadow spittlebug, omniverous leaf tier.
PENNSYLVANIA:	Peaches—plum curculio.
RHODE ISLAND:	Apples—codling moth, leafhopper, plum curculio, red bug, leaf-curling midge, apple maggot.
WASHINGTON:	Cherries—cherry fruit fly.
WISCONSIN:	Apples—apple maggot.
	Cherries—cherry fruit worm.

FIELD & FORAGE CROPS

ALABAMA:	Peanuts—leafhoppers, velvet bean caterpillar.
CALIFORNIA:	Alfalfa Hay—alfalfa butterfly.
COLORADO:	Alfalfa—alfalfa webworm, alfalfa weevil larvae lygus bugs.
	Beans—Mexican bean beetle, flea beetle.
CONNECTICUT:	Beans—Mexican bean beetle, leafhoppers.
INDIANA:	Beans—Mexican bean beetle.
	Alfalfa, Clover—spittlebug, leafhoppers.
MARYLAND:	Alfalfa, Clover—spittlebug, leafhoppers.
MICHIGAN:	Beans—green clover worm, leafhoppers, Mexican bean beetle.
MINNESOTA:	Beets—webworms.
NEBRASKA:	Beans—bean leaf beetle.
	Field Crops—blister beetles.
NEW JERSEY:	Alfalfa, Clover—potato leafhopper.
NORTH DAKOTA:	Beets—leafhoppers.
OHIO:	Beans—Mexican bean beetle, leafhoppers.
	Pastures, Hay—spittlebug, leafhopper.
PENNSYLVANIA:	Clover, Alfalfa—potato leafhopper.
UTAH:	Hay Alfalfa—alfalfa weevil.
VIRGINIA:	Soybeans—Mexican bean beetle.
WISCONSIN:	Alfalfa—spittlebug, leafhoppers.

Under the trade name MARLATE®, Du Pont provides two formulations of methoxychlor: "Marlate" 50-W, a 50% wettable powder for sprays and dusts; and "Marlate" 2-MR, an emulsifiable oil for sprays. To control flies on dairy farms methoxychlor is provided as an active ingredient of Du Pont Dairy Cattle Spray and Dairy Barn Insecticide. For full information, write Du Pont, Grasselli Chemicals Department, Wilmington, Delaware.

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Methoxychlor Insecticides

DU PONT

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150th Anniversary

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

ATLOX® EMULSIFIERS LEAD ALL OTHERS...

Agricultural chemical producers use more Atlox emulsifiers than any other kind. Here are some reasons:

Atlox emulsifiers are universally accepted by toxicant manufacturers for every type of insecticide and herbicide —emulsifiable or oil-diluted concentrates; for use in knapsack, low-gallonage, or high-gallonage sprayers.

Atlox emulsifiers stay put and are virtually chemically inert . . . give concentrates excellent shelf life.

Additional production facilities mean Atlas can duplicate in 1952 its record of meeting all commitments last year.

Atlas provides practical help in developing formulas.

Send for the useful 24-page booklet "Atlox Surface Active Agents for Formulating Agricultural Chemicals." It gives formulas, testing methods, and other valuable information. Technical assistance always is available.

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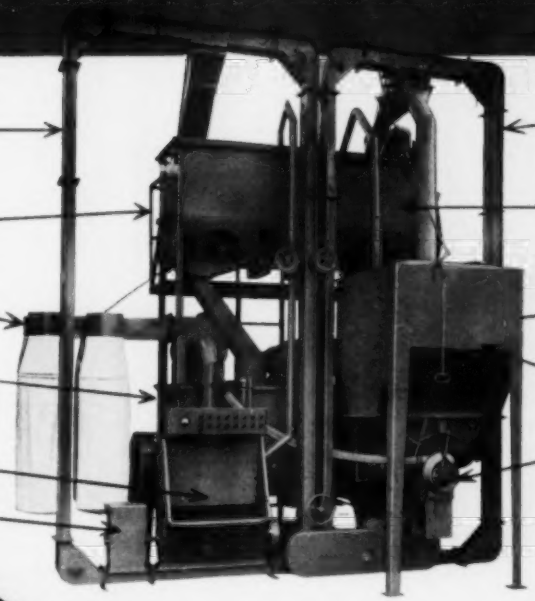
FOR FORMULATING CONCENTRATES . . . and
Processing and Packaging Field Strength Insecticides


Continuous flow elevator No. 1
Catwalk and ladder
Dust control system
Improved design ribbon final mixer
Cut-in hopper with brush sifter and dust hood
Dry ice crusher
Continuous flow elevator No. 2
Improved design ribbon pre-mixer
Fine grinding pulverizer (not visible in picture)
Holding bin
Automatic valve bag packer

UNI-BLENDOR
Dual Type
COMPLETE in one compact unit
. . . NOTHING TO ADD

A. E. Poulsen & COMPANY R.T.R.* **UNI-BLENDOR**
PATENT APPLIED FOR

The R. T. R. UNI-BLENDOR—*Dual type*—performs a dual function:

1. *Formulates concentrates from technical grade toxicants*

2. *Processes concentrates to produce field strength insecticides*

Handling 40 cu. ft. batches, the equipment requires only 11′ x 11′ of floor space and 16′ of head room. Each unit is plant tested to insure maximum efficiency and is shipped in sections which any mechanic can readily assemble.

* * * * * * *

The R. T. R. UNI-BLENDOR—*Standard Type*—mixes and blends dust concentrates with diluents to produce packaged, field strength insecticides of consistently uniform quality. The equipment produces up to four 40 cu. ft. batches per hour and requires only 9′ x 12′ of floor space and 13′ of head room.

*** Ready to Run . . . *and ready to earn***

R. T. R. (*Ready to Run*) Uni-Blendor equipment is designed by engineers who are recognized specialists upon insecticide processing. The units, which incorporate all of the advantages of individually designed plants, require less capital investment in equipment, eliminate the expense of remodeling buildings, avoid delays in installation, disappointments in operation and production—all of which frequently are involved in individually designed equipment.

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Established 1939

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DDT

TECHNICAL DDT

DDT DUST CONCENTRATE

75% DDT WETTABLE POWDER

when you want it promptly

Check with Michigan Chemical for your continuous, fast supply of DDT. You can be sure of exceptionally high purity, uniform production, and prompt service.

Strategically located in the midwest agricultural area, Michigan Chemical is a basic producer of DDT for Agricultural use. This, together with favorable transportation facilities, assures you a most satisfactory source. Just as a trial, place your next order with Michigan Chemical. You'll get results that surpass promises.

MC

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SALES OFFICES: 75 East Wacker Drive, Chicago 1, Illinois — 230 Park Avenue, New York 17, New York

BASIC MANUFACTURERS OF INDUSTRIAL, PHARMACEUTICAL, AND AGRICULTURAL CHEMICALS

. . . use CELITE

One way to be sure of producing a dry dust concentrate that will give top performance in the field is to use Celite in your primary grinds.

The presence of only a small percentage of this diatomite powder—because of its great bulk per unit weight, and the irregular shape of the individual particles—fluffs up the final dust. This helps neutralize the effect of heavy extenders—insuring better dispersion of the poison.

Celite is also an excellent absorption medium for liquid poisons. Its exceptionally high absorption capacity permits a much higher percentage of liquid poison to be absorbed while still maintaining a dry dust concentrate. This results in a more potent effect in the final product . . . as well as in lower packaging and shipping costs.

Why not investigate the use of Celite as a means of improving your product and making your operation more profitable? For further details, write Johns-Manville, Box 60, N. Y. 16, N. Y.

Properties of CELITE

FINENESS: Approximately 100% through 325 mesh
DENSITY (Vibrated): 11 pounds per cubic foot
BULK: Celite bulks much higher than most diluents
ABSORPTION: 200% of its weight of water
300% of its weight of kerosene
pH VALUE: Below 7.0
INERTNESS: Compatible with insecticide and fungicide poisons
SUSPENSION: Excellent in both air and water
COMPOSITION: Celite is amorphous diatomaceous silica (SiO_2)

Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

Johns-Manville CELITE

DILUENTS AND GRINDING AIDS

PROTECTION

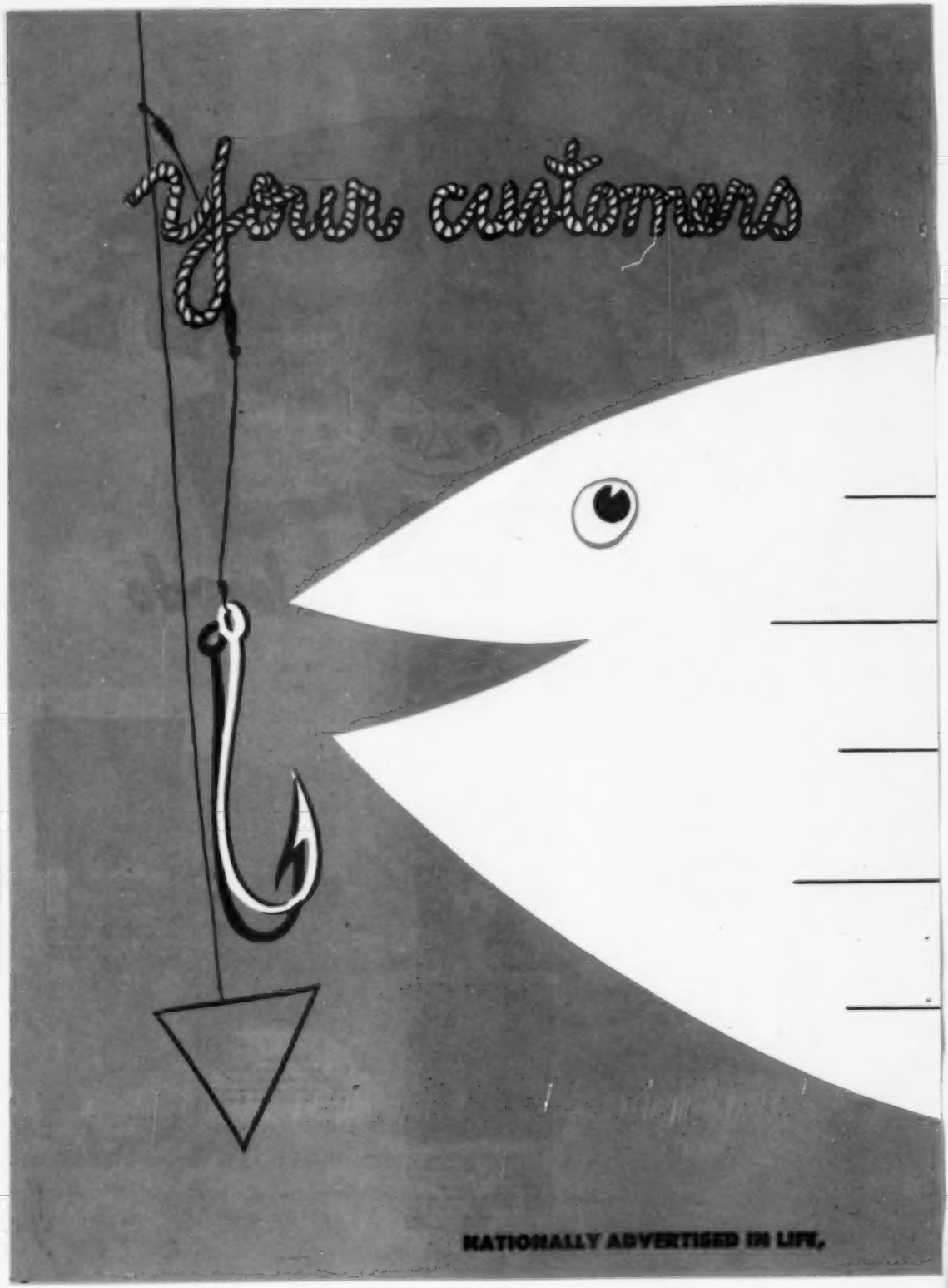
built in

Tough as a Rhino's hide! **Fulton's W.P.P.L.** (Waterproof Paper Lined) **Bag** is a reinforced textile bag that is doing the job of more expensive containers. It is designed especially for products that require protection inside and out. Tough paper or plastic linings are laminated with special adhesives to either cotton or burlap to give your product *extra* protection from moisture absorption, evaporation, or contamination from other outside influences. Maybe this is the package you've been looking for—write for full particulars.

Fulton **BAG & COTTON MILLS**

Atlanta • St. Louis • Dallas • Denver • Kansas City, Kans. • New Orleans • Los Angeles • Minneapolis • New York City

Yield catch
the
big
profits
with...
Colorado .44
YOU'LL
PROFIT WITH
THIS KIND OF
TACKLE...
We Furnish it!
Technical Service
Free technical service without obligation! A technical service designed to consider and advise you and your customers on problems of insect and weed control, is available to you without cost and obligation from Colorado .44.
Local Advertising
Consistent, hard-hitting campaigns in your areas supplement Colorado .44 large scale national advertising, and help presell the customer and make dealer sales and dealer profits soar!
Folders
For your convenience, Colorado .44 has available many sales-stimulating folders and brochures.
Bulletins
Informative, "easy to read," technical bulletins on virtually all phases of insect and weed control are available to you and your customers.


Your customers
NATIONALLY ADVERTISED IN LIFE.

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TOXAPHENE
For better, more economical control of a wider variety of agricultural pests, we suggest Colorado .44 Toxaphene in various combinations and formulations. Colorado .44 Toxaphene is especially potent when used against grasshoppers, alfalfa weevils, armyworms, cutworms, lygus bugs and a variety of cotton pests.

PARATHION
Recommend Colorado .44 Parathion. This versatile insect killer destroys the *green bug* in wheat and all small grains. Carry Colorado .44 Parathion and make your profit and the farmers' income greater. Also unusually effective against aphids, armyworm, citrus scales and many other destructive insects.

BHC
If you're in the market for a profitable item for effective control of cotton and livestock pests, don't overlook Colorado .44 BHC. Show the farmers how they, too, can reap greater benefit through Colorado .44 BHC.

DAIRY SPRAY
Profit-eating livestock pests die fast when Colorado .44 Dairy Spray is used. This powerful insect killer will not harm cattle or humans if used as directed. It's a fast seller, and is fully approved by the USDA for use on dairy cattle. Non-toxic, non-injurious to livestock, poultry and warm blooded animals when used as directed.

LIVESTOCK SPRAY
To stop livestock weight losses resulting from ticks, lice and flies, recommend Colorado .44 Gold Star Barn and Livestock Spray to your customers. It's the best solution for adding pounds to cattle and other livestock, because it eliminates the annoyance of weight reducing pests. Mixes easily in hard or soft water.

ALDRIN
Here's a versatile, fast-moving item which will sell because of its effective action against boll weevils, grasshoppers, locusts and many other destructive pests. Colorado .44 Aldrin features quick action, low-dosage ease of use, economy.

CHLORDANE CONCENTRATE
For the customer who prefers to mix his own solutions, suggest Colorado .44 Chlordane Concentrate. Extremely economical, yet effective for grasshopper, alfalfa looper, armyworm, and many other insect pests.

2,4,5-T
For the elimination of heavy brush, there's completely effective control to be found in Colorado .44 2,4,5-T. Available in many combinations to meet any kind of control desired, Colorado .44 2,4,5-T offers sure elimination of mesquite, scrub oak, stumps and other heavy brush.

COTTON DUSTS
Here are more Colorado .44 products which can be applied with airplane, ground or hand equipment. Colorado .44 Cotton Dusts—in all formulations and combinations—are highly effective against boll worms, cotton leaf worms, boll weevils, thrips, and other cotton damaging bugs.

DDT
Sell widely used Colorado .44 DDT to farmers and watch your profits soar! This is a particularly profitable item to sell in the corn belt because of its effective control of the *European Corn Borer*. Also can be used for high percentage kill of the alfalfa weevil, lygus bug, and countless other destructive insect pests.

rado .44 line

hook line and sinker

LINDANE
For sure, easy control of lice, flies and fleas on livestock, recommend Colorado .44 Lindane. Customers will appreciate the outstanding results of Lindane in controlling livestock pests. Lindane is also formulated to destroy many other agricultural insect pests—including grasshoppers and ants.

CHLORDANE
By stocking up on Colorado .44 Chlordane, you insure having on hand a quick, and permanent knockout for all wheat insects. It's easy to sell consumers on the idea that crop losses can be eradicated by Colorado .44 Chlordane's triple killing action, which kills by vapor, stomach poison, and contact.

2,4-D
Weeds that rob crops of moisture, sunlight and vital minerals are always a problem to farmers. With Colorado .44 2,4-D ester and amines in many economical formulations and strengths, weed and brush control can be achieved at a minimum of cost and labor. Mix in oil and water. Now, a new wonderful feature of Colorado .44 2,4-D Amine formulations. They will not freeze or go out of solution—even at *zero temperature!*

GRUB DUST
Colorado .44 Grub Dust gives almost 100% protection against cattle grubs and lice, thus reducing livestock weight losses. Can be used as dust, dip or spray. Just add a 7½ lb. pack of Colorado .44 Grub Dust to each 100 gallons of water... it kills cattle pests fast! Profits come naturally.

MENT

ry living organism on the
. Nowhere is this so evident
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r or later, be traced to the
resources undergo
nourishing must suck out
l itself.

s come in. Many of the
n POTASH . . . often Sunshine
This fertilizer is more
crops . . . thereby helping

Plaza, New York 20, N. Y.

Specialized products make up the '52 Line!

COTTON SPRAYS AND DUSTS

SPRAYS—Colorado .44 manufactures 9 varieties of Cotton Spray Concentrates. In all combinations—Aldrin, DDT, Dieldrin and Sulphur.

DUSTS—Colorado .44 formulates many combinations of Cotton Dusts, including those with Sulphur, DDT, Toxaphene, Dieldrin, Aldrin and BHC.

AIRPLANE SPRAYS AND DUSTS

Colorado .44 manufactures 153 products especially compounded for airplane application. Included are:

- Aero Butyl Ester 2,4-D
- Super "80" Butyl Ester 2,4-D
- Super Chlordane Concentrate
- Super Toxaphene Concentrate
- Super Parathion Concentrate
- Super Aldrin Concentrate
- Aldrin Equivalent Oil Concentrate

CORN INSECTICIDES

Colorado .44 DDT formulations provide *SURE* protection against corn borers and other destructive and costly corn insects. For greater sales and increased profit, feature the following:

- DDT-Emulsion Concentrate
- DDT-Wettable Powder
- DDT-Dust Concentrate

These, and other Colorado .44 insecticides are available for you today!

ALFALFA INSECTICIDES

Recommend these Colorado .44 products to farmers for faster knockdown, faster kill, and longer lasting killing power of destructive alfalfa insects.

- Aldrin
- Emulsifiable Chlordane Concentrate
- Super Chlordane Concentrate
- Emulsifiable Toxaphene Concentrate
- Super Toxaphene Concentrate

Stock up on these, and other alfalfa insecticides now for maximum profit.

CATTLE SPRAYS AND DUSTS

Control of weight-reducing livestock and dairy pests is becoming a bigger problem every year for farmers and cattlemen. Show them how they can control these pests with the following Colorado .44 products:

- Gold Star Livestock and Barn Concentrate
- Stock and Barn Insect Killer
- Dairy Spray
- Grub Dust
- Ben Hex 12 Wettable Powder
- Sheep Dust
- Lindane
- Rotenone

HOUSEHOLD PRODUCTS

A complete household insecticide and weed killer line is available for stock. These heavily promoted items are profitable to handle, because they sell fast and really do the job. The Colorado .44 household line is as follows:

- Colorado .44 Bug Killer
- Colorado .44 Ant and Roach Killer
- Colorado .44 Garden Spray
- Colorado .44 Garden Duster
- Colorado .44 Rid-O-Weed
- Colorado .44 Chlordane Concentrate

WEED KILLERS

This line-up of highly effective Colorado .44 weed and brush killers, is a guaranteed sales producer. Made of the finest tested formulations, they really do the job—and produce the profit.

- Butyl Ester 2,4D 40%
- 2,4-D Weed Killer Liquid Amine Concentrate
- Super "80" Butyl Ester 2,4-D
- Aero Butyl Ester 2,4-D
- Isopropyl Ester 2,4-D
- Super "80" Isopropyl 2,4-D
- Brush Murder
- Hi-Strength Brush Murder
- 2,4,5-T Concentrate
- Butyl Ester Brush Killer

WHEAT AND SMALL GRAIN INSECTICIDES

This coming season promises an unusually dangerous invasion of wheat and small grain insects. Help the farmer prepare for these destructive pests, by having on hand an adequate supply of Colorado .44 small grain insecticides. The following Colorado .44 products provide high kill, lasting control of aphids, red spiders, thrips, and *green bugs* in wheat and small grain.

- Parathion 25% Wettable Powder
- Parathion Dust 1%
- Super Parathion Concentrate

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INSECTICIDES
AND
WEED KILLERS

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SUNSHINE STATE POTASH
PRODUCT OF NEW MEXICO

REG. U. S. PAT. OFF.

NIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 48/52% K_2O
MANURE SALTS 20% K_2O MIN.

A WHOLE FARM THRIVES ON NOURISHMENT

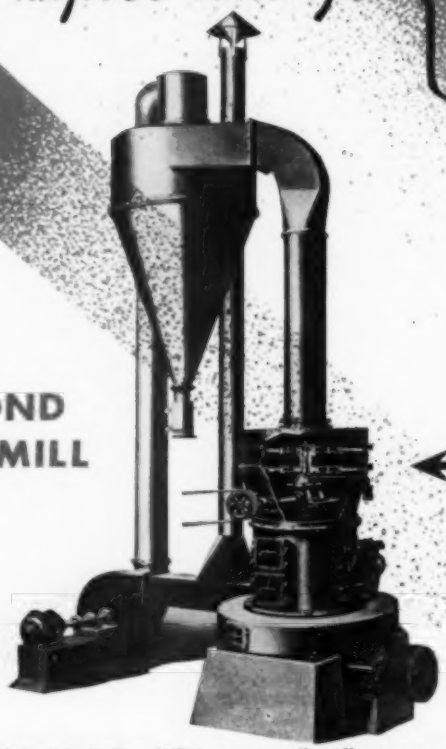
Animal or vegetable . . . each and every living organism on the face of our earth grows 24 hours a day. Nowhere is this so evident as on a farm . . . for a farm's very purpose is to foster a collection of growing creatures and plant life.

Now, every form of growth must, sooner or later, be traced to the soil. And that means the farm's natural resources undergo tremendous drain . . . for this constant nourishing must suck out the rich plant-food elements in the land itself.

That's where soil replenishing fertilizers come in. Many of the most effective of these fertilizers contain POTASH . . . often Sunshine State Potash, a product of New Mexico. This fertilizer is more than a mere soil nutrient. It strengthens crops . . . thereby helping them to resist disease and drought.

UNITED STATES POTASH COMPANY, Incorporated, 30 Rockefeller Plaza, New York 20, N. Y.

All Purpose Unit for { INSECTICIDE GRINDING and BLENDING



RAYMOND ROLLER MILL

WHIZZER SEPARATION

MAINTAINS UNIFORMITY OF FINISHED MATERIAL

Get more information about this versatile mill. Write for Bulletin No. 68.

The Raymond High Side Roller Mill is a versatile, all-purpose unit for grinding and intimately blending concentrates, field strength formulations, sulphur and sulphur bearing insecticides.

Concentrates can easily be produced at finenesses as high as 99% or better passing 325 mesh. Field strength products can be made at unusually high capacities directly from technical grade insecticides.

Whizzer classification provides a wide range of control for meeting today's exacting specifications, and changes in fineness for making different grades are performed by one simple adjustment without stopping the mill. Uniformity of finished formulation is very high.

Clean, dust-free operation and practically continuous operation without shut-down for cleaning are additional Raymond advantages that contribute to quality and economy of production.

COMBUSTION ENGINEERING – SUPERHEATER, INC.

1314 NORTH BRANCH ST.
CHICAGO 22, ILLINOIS

Raymond
PULVERIZER DIVISION

SALES OFFICES IN PRINCIPAL CITIES

Give Your Formulations GREATER STABILITY With...

COOPER EMULSIFIERS

For more efficient formulations . . . with greater suspension power . . . rely on COOPER EMULSIFIERS. Here is a complete new series of emulsifiers, which offer wide versatility. You'll find COOPER EMULSIFIERS more economical, too, requiring less per gallon of concentrate.

YOU GET ALL THESE ADVANTAGES IN COOPER EMULSIFIERS

- ★ Spontaneous dispersion
- ★ Emulsion stability
- ★ Performance with either aliphatic or aromatic solvents
- ★ Versatile—gives optimum performance in many formulations
- ★ Greater suspension power
- ★ Effective in hard and soft water
- ★ More economical—requires less per gallon
- ★ Greater storage stability of emulsifiable concentrate

COOPER DEPENDABLE PRODUCT

COOPER ATX-60 (Pat. Pending)
For optimum performance in Toxaphene, Toxaphene/DDT, Aldrin and Dieldrin systems.

COOPER BCX-70 (Pat. Pending)
For optimum performance in BHC, BHC/DDT and Lindane systems.

COOPER CTX-54 (Pat. Pending)
For optimum performance in Toxaphene, Toxaphene/BHC and Toxaphene/Lindane systems when unusual excellence of performance in dipping vats over long periods of time is required.

Write Today for Samples, Specification and Formulation Sheets

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GREATER SUSPENSION POWER BY ACTUAL TEST!

3% COOPER ATX-60 EMULSIFIER

5% ORDINARY NON-IONIC EMULSIFIER

Actual photos 8 hours after dilution, using 6 lbs. Toxaphene/Gal. emulsifiable concentrate

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Please send free samples and complete information on COOPER EMULSIFIERS, including specification and formulation sheets.

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Call on KOLKER—for technical assistance, delivery and price information.

Products of DIAMOND ALKALI'S subsidiary, KOLKER CHEMICAL WORKS, *specializing in organic chemicals for agriculture and industry.*

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DIAMOND ALKALI CHEMICALS

GAMMA BHC

The New Addition to Kolker's Complete Line of BHC Products for Insecticide Manufacturers

Here's something really new in Technical BHC—especially directed to those manufacturers interested in producing emulsion concentrates and wettable powders with unusually high gamma content.

. . . and don't overlook these Kolker stand-bys . . .

LINDANE

(99% gamma Isomer)
The effective multi-purpose insecticide

36% TECHNICAL BHC

For wettable powders and finished BHC dusts

DIAMOND ALKALI COMPANY

Chemicals you live by

AGRICULTURAL CHEMICALS

Symbol for a new High Grade Muriate of Potash

CONTINUED progress has been made in the installation of modern equipment for mining and refining high grade muriate of potash at the new Southwest mine near Carlsbad, New Mexico.

Production is scheduled to begin about August, 1952. Soon thereafter, the movement of HIGH-K Brand Muriate of Potash for agricultural purposes should start from Southwest.

Southwest Potash Corporation

HIGH-K Potash

*Trade Mark

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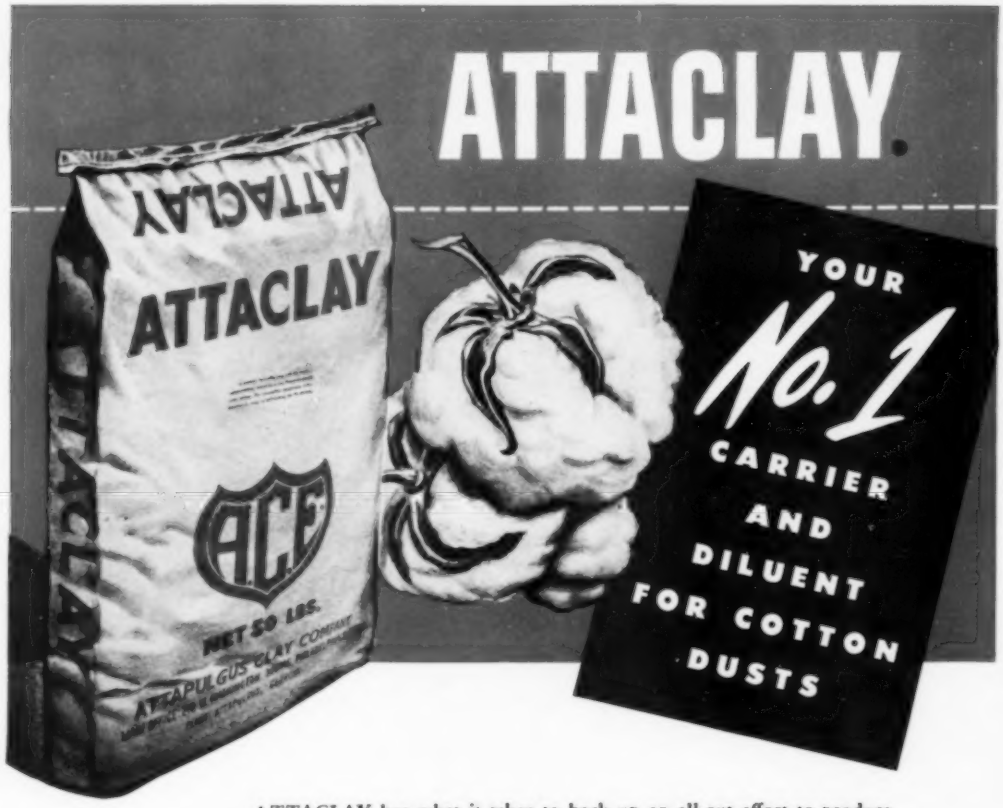

ATTACLAY has what it takes to back up an all-out effort to produce cotton dusts. Let's nail down reasons why you'll get fine carrier and diluent performance at low cost:

FLEXIBILITY. Attaclay is a top-heavy favorite in the following cotton insect control formulations: toxaphene; DDT-BHC; aldrin and aldrin-DDT; dieldrin and dieldrin-DDT; parathion; chlordane-DDT (in areas where recommended). What better answer to a possible insecticide shortage than one carrier which handles them all?

OVER-ALL EFFICIENCY. Attaclay's great sorptive capacity smooths out all types of processing techniques and delivers dry, free-flowing bases. It eases grinding operations with low melting point solids. It permits a one-step procedure when grinding solids in combination. It offers a really satisfactory way to formulate liquid toxicants by direct impregnation. It is highly desirable for direct preparation of field-strength dusts, or for conditioning. You can rely on Attaclay to boost production schedules and enhance product quality.

Cotton dust problems? Let's team up to lick them!

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Phila. 5, Pa.

VALUE

in a cotton insecticide adds up to this—

Fitness for early season and all season—Incredibly small doses of aldrin in early season do your control job on thrips and other early insects. As the season progresses, aldrin takes care of your later control too. No need to change in midstream! (If bollworm appears, just add DDT to aldrin.)

Fast action—Aldrin goes to work right now. You can see dead bugs in less than two hours. You won't have to re-do your work if it rains next day!

High killing power—Effective dosages of aldrin are measured in ounces per acre. Aldrin even kills insects inside the squares . . . and yet aldrin will not harm the crop. Also, aldrin does less harm to insect parasites, thus helping to depress aphid and mite buildup.

Low Cost—Because only ounces per acre are required, aldrin's cost is a bedrock low. And—aldrin is approved in every cotton area in the country!

Easy to use—Aldrin handles easily in any conventional application equipment as either dust or spray. Aldrin can be sprayed *at the same time you cultivate* . . . and it *won't clog* spray nozzles.

Compatible with other insecticides—Aldrin mixes readily and is entirely compatible with other insecticides and fungicides.

So . . . value in a cotton insecticide adds up to aldrin

You can buy aldrin everywhere in the cotton belt.

Ask your dealer for

aldrin

SHELL CHEMICAL CORPORATION

COMPLETE SERVICE

LION PROVIDES DEPENDABLE ONE-STOP NITROGEN SERVICE FOR FERTILIZER MANUFACTURERS

LION ANHYDROUS AMMONIA—For formulation. A uniformly high-quality basic product. Nitrogen content, 82.25%.

LION AQUA AMMONIA—For formulation or acid oxidation. Ammonia content about 30%. Other grades to suit you.

LION NITROGEN FERTILIZER SOLUTIONS—For formulation. Three types to suit varying weather and manufacturing conditions.

LION AMMONIUM NITRATE FERTILIZER—For direct application or formulation. Improved spherical pellets. Guaranteed 33.5% nitrogen.

LION SULPHATE OF AMMONIA—For direct application or formulation. Large free-flowing crystals. Guaranteed nitrogen content, 21%.

LION

Serving Southern States

Lion provides special technical assistance for fertilizer manufacturers. Write us if you have a formulation problem.

LION OIL COMPANY CHEMICAL DIVISION, EL DORADO, ARK.

There's a Better Way to Control Insects, too!

Buy *Pittsburgh* METACIDE* 50

Here's a powerful new answer to insect control problems—Pittsburgh Metacide 50. This new organic phosphate insecticide contains *50% active ingredients.* Manufactured in an easy-to-use liquid concentrate, it has a strength equal to Parathion and is less toxic to mammals. Pittsburgh *Quality-Controlled* Metacide 50 effectively controls an exceptionally wide range of insects attacking fruit, vegetable and forage crops.

● *Write today for free Metacide information bulletin.*

*Metacide is a trade mark of Chemagro Corp., New York, N.Y.

PITTSBURGH AGRICULTURAL CHEMICAL COMPANY

EMPIRE STATE BUILDING, NEW YORK 1, NEW YORK

Standard for Quality

ORGANIC INSECTICIDES: Benzene Hexachloride, Toxaphene, Dichloro Diphenyl Trichloroethane, Aldrin, Dieldrin, Chlordane. **ORGANIC PHOSPHATE INSECTICIDES:** Parathion Wettable Powders, Parathion Liquid Concentrate, Metacide. **WEED KILLERS:** 2,4-D Acid, 2,4-D Amine Concentrates, 2,4-D Ester Formulated Concentrates, 2,4-D Sodium Salt Monohydrate, 2,4,5-T Formulations. FUNGICIDES, SEED DISINFECTANTS, COTTON SPRAYS AND DUSTS, AND OTHER SPECIAL AGRICULTURAL CHEMICALS.

A DIVISION OF
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WAD 4028

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Your choice of formulations... when you use

HI-GAM® 99 LINDANE

PRODUCT INFORMATION

Pennsalt Hi-Gam 99 (lindane)

Description: Technically pure lindane containing 99% or more gamma isomer of BHC.

Form: Fine, white, hard crystalline particles.

Melting Point: Approx. 112° C. (pure gamma isomer of BHC).

Shipped in convenient 10, 25 and 50 lb. containers.

SOLUBILITIES (Approx.) in some Typical Solvents.

Solvent	% lindane by weight (room temp.)
Cyclohexanone	40-50
Mesityl oxide	35
n-Butyl acetate	30
Xylene	25
Isophorone	25
Diesel oil	4
Kerosene	2
White oil	2

With Pennsalt Hi-Gam 99 you get lindane in technically pure, easy-to-handle form. This fine crystalline material can be compounded into the formulations your customers want most. Hi-Gam 99 lindane offers the "punch" of BHC without the excess bulk or penetrating odor.

And for suppliers not equipped to handle technical materials, Pennsalt offers these two popular lindane formulations:

Pennsalt Hi-Gam W-25

Wettable powder containing 25% lindane. Recommended for control of: certain insect pests on livestock; flies in dairy barns; and many truck crop pests. Also used by formulators as a dust concentrate.

Pennsalt Hi-Gam E-20

Emulsion concentrate containing 20% lindane (1.66 lb. lindane per gal.). Widely used in pest control work for control of household and industrial pests.

Investigate the benefits possible through use of Pennsalt's lindane products in your finished formulations. Order now to insure an adequate supply. Remember, technical assistance is always available, so write or call: Agricultural Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa. Bryan, Texas • Montgomery, Ala. • Portland, Ore. • Tacoma, Wash. • Los Angeles and Berkeley, Calif.

Pennsalt Chemicals

PROGRESSIVE CHEMISTRY FOR OVER A CENTURY

PYRAX ABB GIVES YOU DENSER CLOUDS, BETTER COVERAGE

Do you know why Pyrophyllite has become the fastest growing agricultural diluent in the last twelve years? . and why more Pyrax ABB is used than *all other Pyrophyllite?*

First, Pyrax ABB is extremely well adapted to aircraft dusting because it forms dense clouds that hug the crop . no waste from drifting clouds that settle on adjoining fields.

Second, Pyrax ABB adheres electrostatically, even to the dry underside of foliage you can dust anytime without waiting for proper moisture conditions.

Third, because Pyrax ABB is nonhygroscopic and chemically inert (pH between 6.5 and 7.0), it will not affect the toxic strength of botanicals, DDT, benzene hexachloride, toxaphene, thiocarbamates, or the newer organic toxicants . . . therefore you can use *less* toxicant and *even store these dusts from season to season* without affecting their killing power.

If you need a free-flowing, non-absorptive, neutral, and nonhygroscopic agricultural dust diluent that is always in dependable supply, write today for *all* the reasons why you should be using Pyrax ABB.

R. T. VANDERBILT CO.
Specialties Department
230 Park Avenue **New York 17, N. Y.**

☐ Please send technical information on PYRAX ABB.

☐ Please send sample of PYRAX ABB.

NAME .....

POSITION .....

(Please attach to, or write on, your company letterhead)

contact for fast delivery of Chicago sludge

Chicago Heat-Dried Activated Sludge, Nitroganic Tankage, a valuable fertilizer and soil conditioner, is now available in large quantities. An excellent raw material for the manufacture of balanced fertilizers, it supplies organic nitrogen, available phosphoric acid and humus. Contact H. J. Baker & Bro. today for further information.

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What goes into BAGPAK service to make it so dependable?

Pulp wood from I.P.'s own woodlands, converted into kraft at I.P.'s own paper mills, and made into bags in I.P.'s own bag plants. Practically everything that goes into the manufacture of a Bagpak bag is furnished by the facilities of International Paper.

"you can bank on Bagpak!"

Bagpak has been manufacturing multiwall paper bags since 1928 — makes all kinds of multiwalls, in basis weights to meet any strength required, in a complete size range, without printing or with "non-smear" printing up to four colors.

"you can bank on Bagpak!"

Five different I.P. Mills supply bag kraft — not only Natural but also Colored Kraft Paper, as well as Polyethylene Liners, Asphalt Laminated Kraft and Wet Strength Paper. Each bag mill is located on two or more different railroads. Two traffic departments assure prompt delivery.

"you can bank on Bagpak!"

for heavy duty multiwall bags: — bags, bag closing materials, car liner, palletized shipments when required, packaging machines and scales — all from one source of supply! Staffs of experts help you with bag designs and packaging problems.

"you can bank on Bagpak!"

All these go into the business of providing you with a dependable supply of multiwall paper bags. For the answer to any particular multiwall bag problem, write to:

Dept. D-1 BAGPAK DIVISION, International Paper Company, 220 East 42nd Street, New York 17.

International Paper COMPANY

BAGPAK DIVISION

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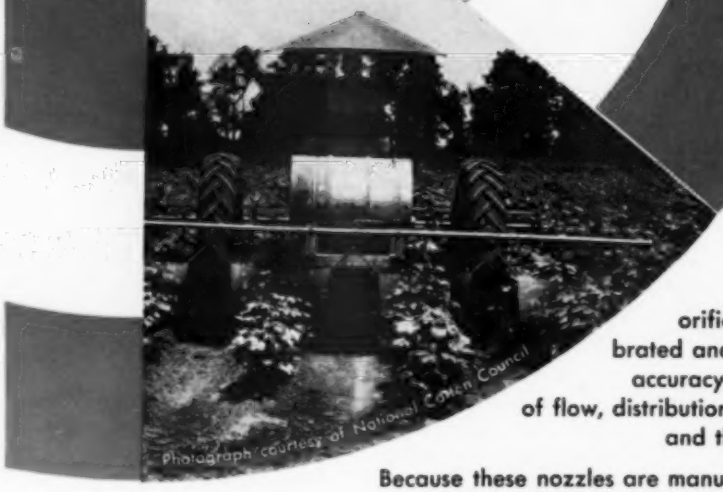

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Application of 10-10-10 on pasture brings $13 return for every dollar spent for Armin Piel,

FOUNTAIN CITY, WIS.

"Last year," says Armin Piel, Fountain City, Wis., "I conducted a test to compare for my own satisfaction the forage yield on fertilized and unfertilized land. The land was pasture that had never been plowed.

"I applied 500 pounds of 10-10-10 fertilizer on an acre of Kentucky blue grass pasture and the yield was 13,875 pounds of dry matter. On an acre unfertilized, the yield was 4,125 pounds. The 10-10-10 meant an increase of 9,750 pounds of dry matter.

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Make use of data like this in your own promotional efforts on high-nitrogen fertilizers. They'll pay off for you in steadily increasing sales of these materials.

And to give farmers the type of fertilizers that will yield the best returns, use U·S·S Ammonium Sulphate to supply a major part of the nitrogen content. It contains nitrogen that won't leach out during spring rains, yet converts to readily available form in the growing season. U·S·S Ammonium Sulphate is dry and free-running . . . won't set in storage . . . doesn't clog drills or other distributing equipment.

For complete information, contact the nearest district sales office or write to United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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UNITED STATES STEEL

Laborer. • 1952 MODEL

No matter how good a man may be with a hand shovel and wheelbarrow, his production is many times greater as a "PAYLOADER" pilot. What's more — both he and his boss are happier because they both make more money.

In hundreds of fertilizer and chemical plants "PAYLOADERS" have taken over unpleasant, laborious material-moving chores — saving time, cutting costs and increasing production. They scoop up, carry, dump, spread and stockpile all kinds of materials such as fertilizer, chemicals, coal, coke and ashes . . . lift, push . . . spot and unload box cars and do many other cost-cutting jobs . . . release manpower for more productive work.

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..A GREAT DEFENSE...

..AGAINST PESTS IS GEIGY'S GREAT OFFENSE!

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From Maine to California — From Florida to Washington — There's a Geigy formulating plant strategically located and expressly equipped to meet your requirements.

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The hard fact of the matter is that Geigy's foresight is paying off in better, faster service and in products specifically tailored for local conditions and demands.

In other and better words, your best defense against pests and weeds is Geigy's great offense (a complete line of products backed by complete service).

Therefore, whatever your requirements remember Geigy represents the highest standards of quality, dependability and service.

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NON FIRE-HAZARDOUS!

POLYBOR-CHLORATES destroy *all* vegetation quickly and easily when applied properly! In POLYBOR-CHLORATES you get the combined effectiveness of borates and sodium chlorates . . . spraying results in fast killing action by contact *plus a residual effect* for complete destruction through root-action. Highly soluble POLYBOR-CHLORATES are potent, general-purpose weed and grass killers for spray applications . . . especially useful for the quick destruction of tall standing vegetation where mowing or scalping is neither feasible nor desirable. Convenient nonflammable POLYBOR-CHLORATES are the good economical answer to all tough weed problems . . . send for information now!

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DIVISION OF BORAX CONSOLIDATED LIMITED

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FROM FIRST COST TO LAST

LESS PACKAGING EXPENSE

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DEPENDABLE SIFT-PROOF PAPER BAGS SPECIALLY ADAPTED FOR SHELF-UNIT PACKAGING OF CHEMICAL PRODUCTS

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BAG TYPES FOR MANY NEEDS

- Heavy-duty construction, wax-treated or asphalted paper when desirable
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- Excellent printing characteristics
- Cut so paste can't ooze
- Protective "shingle" construction; no open area through which contents can sift

CHEM-PAK STANDARD

Made with the original and justly famous Union sift-proof feature.

- Thermoplastic applied to inside top portion of bag
- Closure can be made on standard heat-sealing equipment
- Paper combinations to suit the individual protective qualities desired
- Excellent printing surface for shelf display packages
- Bottom has famous Union sift-proof "shingle" construction

CHEM-PAK UNISEAL

Standard CHEM-PAK with a thermoplastic application to effect a heat sealed closure.

- Can be closed on standard heat-sealing equipment
- Heat-sealing top guarantees a sift-proof closure
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- Bottom squares out flat for easier packaging, better shelf display
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CHEM-PAK UNITHENE*

Special Duplex paper combination. Inner ply – Unithene.*

**UNITHENE*—*Union high-test kraft with control-coated polyethylene.*

VERSATILE CHEM-PAK bags are certified sift-proof. They meet requirements of the Interstate Commerce Commission – are safe even for Class "B" poisons. You'll find them an excellent solution for most packaging problems where dry chemicals are put up in units of twenty-five lbs. or less.

CHEM-PAKS are made in a wide range of paper combinations and closures, suitable for almost any dry chemical sold in small retail units. Their protective qualities compare favorably with more expensive containers. They are easy to handle, inexpensive to pack and ship, colorfully suited to retail display.

Measure your present package against CHEM-PAK. You can make a quick, accurate appraisal with Union's new Chemical *Package Evaluator*. This handy guide is yours for the asking. The coupon brings it.

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THE EDITOR COMMENTS

SECRETARY Brannan's recent memorandum to heads of department agencies concerning the utilization of fertilizers, puts an official stamp of approval on the vast expansion program being undertaken by the fertilizer industry. A coordinated program for making efficient use of these increased fertilizer supplies will presumably be forthcoming in an effort to help agricultural production keep pace with mounting needs.

In his memorandum, the Secretary points out that supplies of fertilizers in recent years have not been adequate to meet our needs, and that the Department is working for substantial increases in plant food production. "By 1955," he says, "The desirable level of fertilizer use is expected to be about 70% more nitrogen, 55% more phosphate and over 50% more potash than was available for the 1951 crop year."

He went on to say that these amounts of plant food have been recognized as defense production goals and that it now appears that the nitrogen goal will be met by expanded plant capacity. The potash industry is moving ahead with production facilities and is expected to meet its goal by 1955. However, the phosphate production goal may be difficult to attain because of the sulfur shortage.

The agency heads were asked to carry out "vigorous, coordinated effort in cooperation with State and local agricultural agencies, the fertilizer industry and others;" and the Department Fertilizer Committee was requested to develop plans for a coordinated program to provide "every practicable assistance and incentive to get the increased supplies of needed fertilizer used properly and efficiently." This committee will work with Department agencies, those of Land-Grant Colleges, the Fertilizer Industry and other interested groups.

That the secretary is depending upon the fertilizer industry to do a big and significant job, is heartening. This is the kind of setup where private industry can and will deliver the goods . . . and the whole world is watching to see how well it is done.

JUST when we thought that the infinite variety of ways to spend the taxpayers' money had been exhausted, we find a new idea coming up in the UNICEF setup of the United Nations. It is the proposal to build, using largely U. S. funds, of course, four new DDT plants in Asia. While the plan has not yet gone through (and let's hope it won't) it is well for us to consider a few of the matters such a proposal would involve.

In the first place, American plant capacity is capable of meeting world demands for DDT. Secondly, it seems somewhat short-sighted for any U. N. group to set out deliberately to reduce the strength of American industry which supplies most of its operating funds. That's just what it would be doing, since such plants abroad would compete directly with American-made insecticides. Meeting competition which stems from private companies in other lands is one thing, but seeing our own tax money being used to *create* such a situation is quite another matter to consider.

When will the spenders awaken to see what they're doing? Will they continue pumping their main source of revenue until the well is dry?

So far as world economics go, DDT itself is relatively small. Just the same, it seems to us that a broad principle is involved in this case. If our monies can be used for building competitive DDT plants abroad, why can't the same notion apply to other lines, as well? Once under way, these hand-out groups are extremely difficult to stop. Such ideas are better halted before they materialize.

New weed killer effective at low dosages said to last longer and to control wider range of weeds than any other material.

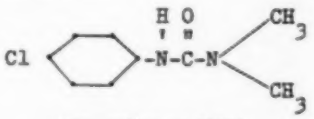
"CMU"; New Herbicide

CHEMICALS have been used for hundreds of years to kill unwanted plants or weeds. Salt and cheap by-products of industry such as ashes, smelter wastes, waste oils have all been tried.

However, use of these chemicals on a large scale was restricted due to the large amounts required for a satisfactory job. The cost and difficulty of transporting these large quantities presented an economic barrier and limited their adoption on a large scale. Rapid development and widespread use of herbicides has coincided with the synthesis of organic compounds highly toxic to plants and much more effective than the older chemicals on both a dosage and use-cost basis.

Advent of the highly effective organic compounds as herbicides dates back to about 1933 when dinitro-o-cresol was developed in France as a selective spray for cereals. Interest in herbicides became widespread and progress was stimulated greatly by the discovery in the early-40's that 2,4-dichlorophenoxyacetic acid was a potent and versatile herbicide.

Since that time, progress has been continuous and a number of organic compounds have made their appearances as herbicides. One of the most recent and significant of these is CMU, 3-(p-chlorophenyl)-1, 1-dimethylurea.



Properties of CMU

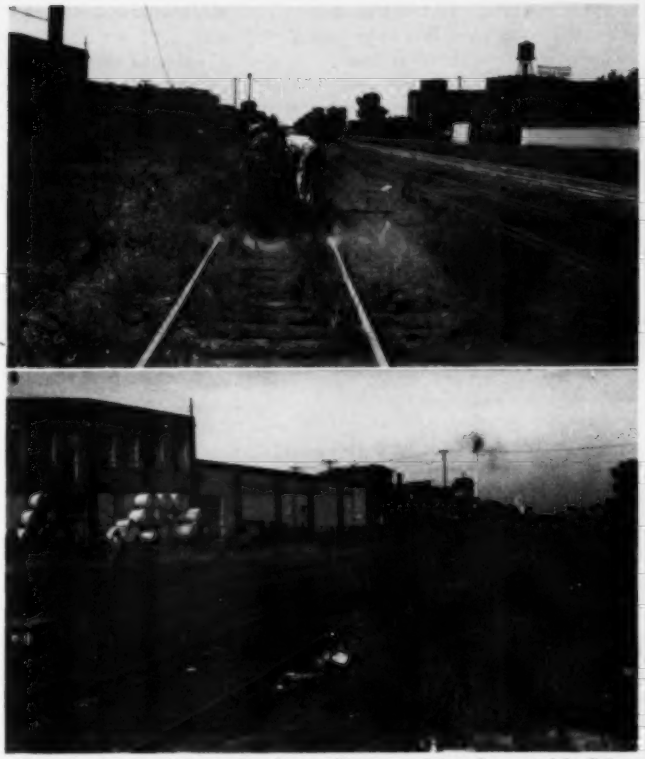
A MEMBER of a new class of herbicidal compounds, CMU was first synthesized by reaction of p-chlorophenyl isocyanate with dimethyl amine. 3-(p-chlorophenyl)-1, 1-dimethylurea melts at 169.8°-170.4°C.

Foreground area in photo below was given a pre-emergence treatment with CMU. Darker background is check area where weeds were allowed to grow. The crop is cotton.

by

G. L. McCall

Weed Control Specialist
E. I. duPont de Nemours & Co., Inc.
Wilmington, Delaware



Control of unwanted weeds along railroad rights-of-way has been one of the most successful uses of CMU. Above: applying the material. Below: same track a few months later. (Photos by duPont Co.)

Technical CMU is a greyish white solid with a slight odor. It is sparingly soluble in such polar organic solvents as ethyl alcohol and acetone and is of very low solubility in the hydrocarbon solvents.

The technical material is slightly soluble in water — approximately 230 parts per million at 25°C. CMU is very slightly acid in reaction with a saturated water solution having a pH of 6.26.

When formulated as a wettable powder containing 80 per cent by weight of technical CMU, the material is easily suspended and sprayed in water. Inherently it possesses most of the qualities needed in an ideal herbicide.

CMU is extremely effective at very low dosages, being effective over a longer period of time and against a wider range of weeds than any herbicide presently known. Because of its relatively low flammability, CMU does not create serious fire hazard on dried vegetation or clothing. It is non-volatile and, when used near crops, offers little hazard if reasonable care is taken to prevent the spray solution from drifting. CMU can be sprayed safely around metal installations such as posts, guard rails, railroad switches, and buildings, where the use of certain other herbicides is precluded.

Toxicology

WHENEVER a chemical compound becomes widely used as a herbicide it is highly important to determine possible hazards to the user. Toxicological tests with CMU indicate that its acute toxicity is of a low order. The LD_{50} of 3-(p-chlorophenyl)-1, 1-dimethylurea by oral administration to male rats is approximately 3,500 mg/kg of body weight.

In skin tests with guinea pigs, application of a 33 per cent aqueous paste of CMU produced no skin irritation and gave no indication of sensitization. Tests regarding possible chronic toxicity are in progress.

Mode of Action

WITH a few notable exceptions, it is necessary for growing plants to draw upon the soil for mineral elements that enter into their composition. Most of the water uptake occurs in roots which are the specialized organs of absorption.

Because of this absorption ability, roots often serve as the avenue of attack for herbicides by taking up the chemical when it is applied to the soil. If the herbicide is present in a lethal concentration, death of the plants will result. CMU appears to fall into the group of herbicides which act primarily through the root systems of plants.

The initial effect on the weed is evidenced usually by leaftip dieback and burning of the leaf margins. These symptoms generally appear first on the older leaves and are followed by a progressive chlorosis, retardation of growth and death of the plant.

CMU has little or no effect upon seeds in the soil even at relatively high rates. When used at 40 pounds per acre, the compound will usually kill all weeds present at the

time of treatment. If the treated plots are checked from time to time, following treatment, it will be found that seedlings are continuously sprouting in the area. However, they soon begin to evidence the CMU symptoms described above and die before they reach an appreciable size.

When CMU is applied to the soil at rates of ½ to 8 pounds per acre, it may serve as a pre-emergence weed control treatment on crops tolerant to low dosages. Applied at higher rates of from 20-80 pounds per acre, it may control all plant growth. In addition to dosage differences, the differences in the effects produced by the two types of soil treatment depend upon a number of factors such as rainfall, soil type, plant species involved, placement of crop seed, etc.

Many Tests Made

CMU has been widely tested in every state in the United States, Puerto Rico, Hawaii and Alaska, as well as in Canada. Experiments have also been carried out in Cuba, Honduras, Sweden and the United Kingdom.

The material has been shown to do an outstanding job when used at rates of 20-80 pounds per acre. At these rates, CMU will kill grasses as readily as broad-leaved weeds and at the higher dosages in this range it will control perennial as well as annual weeds. Comparatively small amounts of from 1-10 pounds per acre of the material control such annual weeds as crabgrass, smartweed, chess, pigweed, annual ragweed, sandbur, purslane, barnyard grass, foxtail, carpet weed, kochia, morning glory, cockle bur, etc. The list can be extended over an extremely large number of additional annual plants.

Applications of from 20-40 pounds per acre usually are required to kill the perennial broadleaved weeds and grasses. Among the weed species in this group that are controlled by CMU may be listed bindweed, ironweed, vervain, Canada thistle, quack grass, Bermuda grass, sheep sorrel, as well as a large number of other species.

Other tests have also been conducted using CMU for the selective control of weeds in crops. The results appear very promising in a number of instances and will be discussed more fully later.

Herbicidal Efficiency

As mentioned previously, CMU usually does not kill by contact but seems to act primarily through the soil on the roots of the plants. Consequently, it is usually much slower in action than the contact herbicides.

A number of factors may have an important bearing upon the performance of CMU. Some of the more important are as follows:

Rainfall. Probably the most important single factor. Rainfall is necessary to carry the material into the soil where it can act on plant roots. When applications are followed by a drought, results may be slow in appearing or absent until rains occur.

Because of the relatively low solubility of CMU, an appreciable amount of rain is necessary to carry the material down into the deeper portions of the zone where a part of the root system of the deep-rooted perennials is located. Consequently, it may require a somewhat longer period of time to completely kill this type of plant than the shallow-rooted type. The low solubility of CMU also makes it quite resistant to leaching from the soil and insures its persistence for some time.

Soil Type. At equal rates, CMU produces a greater effect on plants growing in light soils than it does on those growing in the heavier type soils. A smaller dosage is required to kill plants growing in sandy soil than in soils of the clay-loam variety. The effect of CMU becomes evident more quickly in sand than it does in heavier soils, while residual effect is lost more rapidly. Soils containing a high percentage of either organic matter or soil colloids require a somewhat greater dosage of CMU to produce an equivalent result but the effect also persists longer.

Plant Species. As is the case with all known herbicides, there is a variation in response of different species of plants to equal dosages of CMU. In general, annual weeds require less of the compound for control than do perennial weeds. Probably this is due in part to the fact that roots of perennials penetrate much deeper than do those of annuals. Consequently, more material is required to produce a lethal concentration throughout the root zone and a somewhat longer time may be required for the compound to penetrate deeply into the soil.

In general, shallow-rooted perennials require less CMU for control than do the deep-rooted ones. For example, quack grass and Bermuda grass are killed by dosages of 20-30 pounds of CMU per acre while deep-rooted bindweed and Johnson grass may require from 40-60 pounds for control.

However, there also seem to be relative degrees of tolerance among plants which can be classified roughly as having the same type of root systems.

Rates of Application. When all other factors are the same, the length of time that CMU will persist in lethal quantities in the soil will depend upon the rate at which it is applied.

At a rate of 1 pound per acre applied as a pre-emergence treatment, CMU will control most annuals for a period of 6-8 weeks. Twelve pounds per acre have kept soil free of vegetation for a period of 10-12 months, while rates of 50 pounds per acre have kept soil bare for 18 months and the experiments are still in progress.

Method and Timing of Application. CMU has been formulated as an 80 per cent wettable powder and is applied as a water suspension. Because it works mainly through the soil, it is necessary that CMU be applied thoroughly and evenly over the treated area. Fifty gallons or more of water per acre are usually used to insure even distribution.

Time of application also has a bearing on the efficiency of CMU applications. When applied as a pre-emergence treatment before weeds are

(*Turn to Page* 127)

Mohr, Allstetter, MacLeod, Boyce and Freeborn among speakers as San Francisco plays host to

NACA Convention

IN its first meeting on the west coast in fifteen years, the National Agricultural Chemicals Association held its annual spring convention at the Fairmont Hotel, San Francisco, April 6-9. More than 300 persons registered for the meeting, but with many wives in attendance, the total figure was considerably higher.

The group heard the annual report of its president, Arthur W. Mohr, president of California Spray-Chemical Corp., Richmond; and talks by representatives of Federal and State Agencies; experiment stations, University of California and Western Growers. The annual banquet was held April 8, followed by several acts of entertainment.

In his talk on the opening day of the meeting, president Mohr pointed out that the industry has developed many new chemicals which have reduced greatly the depredations of harmful insects and plant diseases. "Frequently, the new chemicals have provided protection for crops where a few years ago there was no known control against insects and diseases which were destroying them. The new materials have improved greatly the control of external parasites on animals so that their use has increased meat production substantially. The new chemicals have accomplished a

Meeting Sidelights

NAC's first California meeting turned out to be a great success. Attendance did not suffer seriously, many new faces were in evidence, the local committee worked hard to assure success of the gatherings, and the only disappointing part of the affair was the famed California sunshine which turned out to be mostly of the wet variety. Nevertheless, the eastern visitors enjoyed the opportunity to ride the cable cars, roam through Chinatown, visit such scenic spots as Muir Woods, the Golden Gate, Mount Tamalpais, Twin Peaks, etc.

* * *

San Francisco is of course world renowned for its bars, bistros and restaurants, and, after meeting hours, it was no trick at all to buy or sell a cup of BHC while soaking up the view of San Francisco from the Top of The Mark, or to run across an insecticide peddler at the Barbary Coast, the Domino Club, the Papagayo Room, the St. Francis, etc.

* * *

One of the high points in the social program was a cocktail party at the St. Francis Yacht Club, courtesy of the Western Ag. Chemicals Assn. Buses took the convention party from the Hotel to the attractive Yacht Club where, in addition to drinks and food, the visitors were afforded an incomparable view of San Francisco bay and entertained at the same time by a hot dance band,—but no clams.

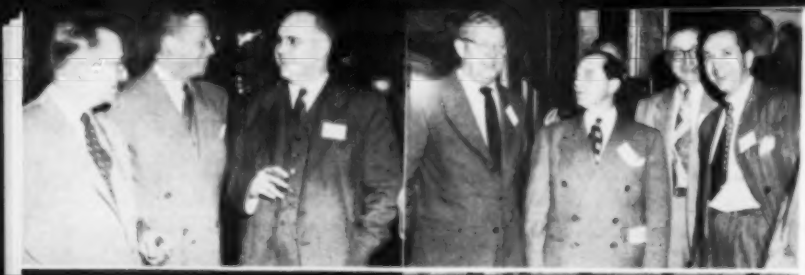
* * *

The work of the arrangements committee was outstanding. Composed of Association members located on the west coast, the group had obviously worked hard with great attention to details, to make the meeting a success. Visitors from other parts of the country were much impressed with the California brand of hospitality. Chairmanned by L. T. Kett,

(Turn to Page 119)

Below: Past presidents G. F. Leonard (L) and Ernest Hart (R) shake hands in front of current NAC head, A. W. Mohr.

Right: John D. Conner, NAC counsel, speaks at Tuesday's session. At right are L. S. Hitchner and J. A. Noone.



great deal in controlling weeds and brush in pasture lands, again gaining greater meat production at lower cost. They are controlling forest pests, thereby preserving our trees and aiding the lumber and paper industries," he declared.

The president went on to say that "All of these things are of tremendous value to the American people, especially in times of need for maximum production such as we are experiencing now. It is difficult to put a dollar sign on the increased value of the food and fiber crops of

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Photos This Page

Top row: J. C. Crissey, GLF, Ithaca, N. Y.; J. B. Sutliffe, Gen. Chem. Co., San Francisco; and Ed. Phillips, GLF, Ithaca. Wayne Mills, United Co-op., San Mateo, Calif.; Richard Yates, Hercules Powder Co., Wilmington, Del.; Paul Dresher, Amer. Chem. Paint Co., San Jose, Cal.; and Joseph A. Noone, NAC Assn.

Second row: Ernest Hart, Middleport, N. Y. and A. W. Mohr, Richmond, Cal., past president and president, respectively, NAC Assoc. James R. Hile, Detroit, Mich. and Dr. Alvin J. Cox, Palo Alto, Cal.

Third row: Group at "clambake" on S. F. Bay; C. O. Persing, and C. L. Arnold, Stauffer Chemical Co., San Francisco; and K. B. Stuart, Denver, Colo.

Fourth row: Leonard Gopp, Detroit, Mich., at drums during "clambake;" M. H. Nabors, Tennessee Products, Nashville, Tenn.; R. S. Thompson, Thompson-Hayward Chem. Co., Kansas City; Jack Brunton, Kolker Div. of Diamond Alkali; Irving Bales, Chipman Chem. Co., Bound Brook, N. J.; and Mercer Rowe, Ashcraft-Wilkinson Co., Atlanta.

Fifth Row: Dr. Stanley B. Freeborn, Univ. of Calif.; Dr. A. M. Boyce, Riverside, Calif. and W. C. Jacobson, Sacramento, Calif., speakers. Mr. and Mrs. Ed. Dobbin, Edco Corp., Elkton, Md.

Below: Mr. & Mrs. Ed Littooy, San Francisco; and speakers Joseph Cary, W. R. Allstetter and G. F. MacLeod.

the nation made possible by the new developments of the pesticide industry, but it is my belief that it can be measured in billions. This reflects to the good of our entire population in the way of ample supply and lower prices," he went on to say. That the public needs to be appraised of these facts, was emphasized by Mr. Mohr. Armed with such information, the public is not likely to allow "hamstringing" legislation to be enacted to halt the industry's advancement.

Mr. Mohr also laid heavy stress on the necessity for the current "buy early" campaign directed at pesticide users. He declared that unless manufacturers are able to ship a considerable portion of their finished products before the peak of the season, it may become necessary to halt production because of lack of stor-

Photos This Page

G. F. MacLeod, Mrs. M. Wertheim, Fairmont Hotel; Ed. Littooy; M. B. Turner, Amer. Chem. Paint Co., Ambler, Pa; and Wayne Mills.

Second photo: W. F. Newton, Columbia Southern Chem. Co., Pittsburgh, Pa.; Charles F. Lunsford, W. R. Grace & Co., San Francisco; O. W. Andrews, Columbia Southern Chemical Co. and David Lynch, Prentiss Drug & Chemical Co., Inc., New York.

Third photo: Joseph Cary; Jack Vernon, Niagara Chemical Division, Middleport, N. Y.; George F. Leonard, Tobacco By-Products & Chemical Corp., Richmond, Va.; L. S. Hitchner, NAC executive secretary; and Jack M. Taylor, Taylor Chem. Co., Aberdeen, N. C.

Bottom row: speakers Larry Kett; W. C. Ball, and A. W. Mohr; Howard J. Grady, Calif. Spray-Chemical Corp., and Mr. Kett, chairman of the arrangements committee.

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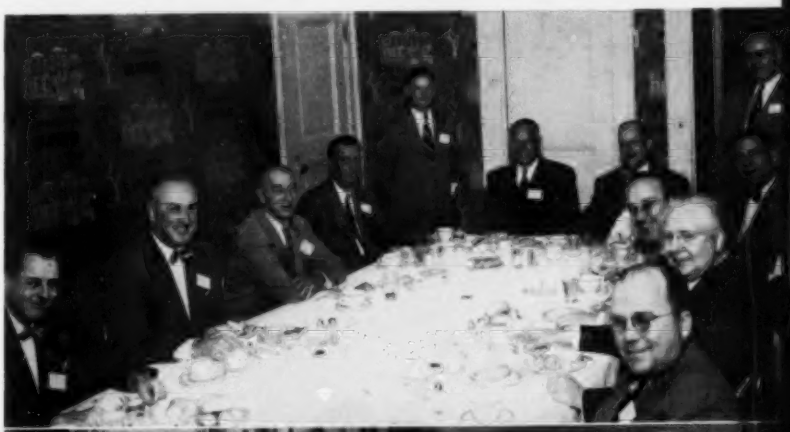

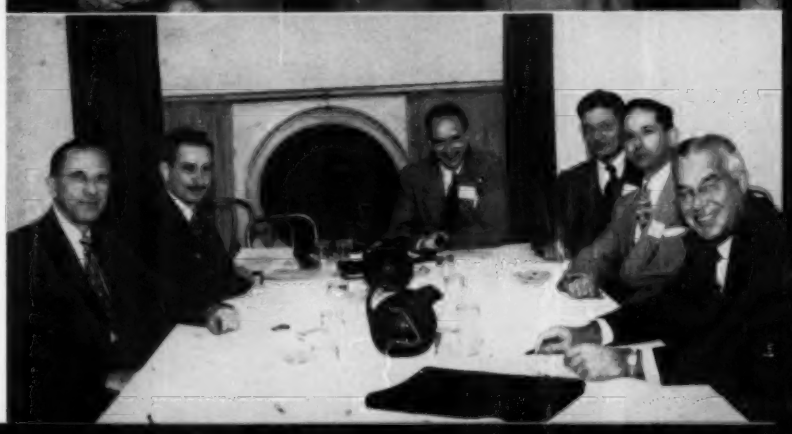

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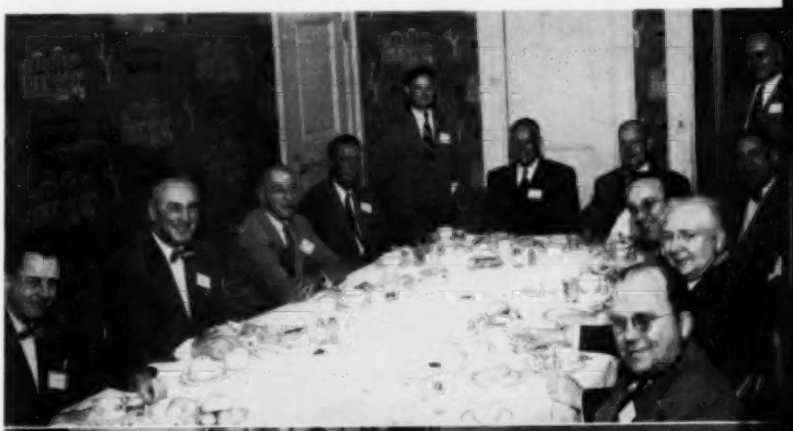

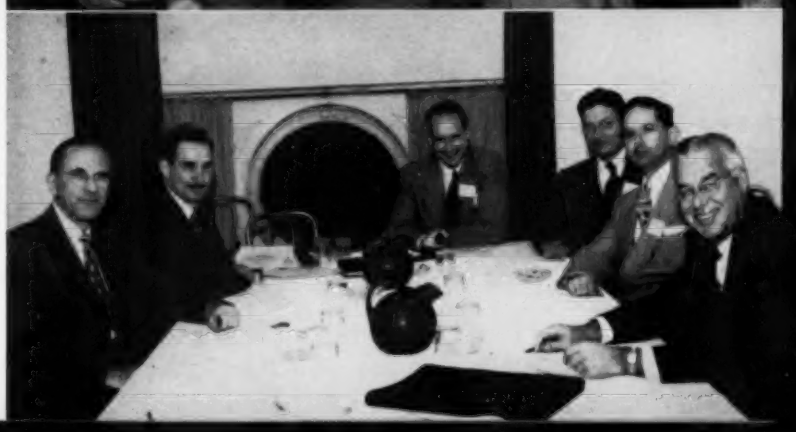

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Well-known Personalities Feature Program for 27th June Convention of

NATIONAL FERTILIZER ASSOCIATION

Greenbrier Hotel—White Sulphur Springs, W. Va.

June 16-18, 1952

ITS 27th annual June convention has been announced by the National Fertilizer Association, to be held at the Greenbrier Hotel, White Sulphur Springs, W. Va., June 16-18. Distinguished leaders in the agricultural, industrial, governmental, and educational fields will comprise the roster of speakers on the program.

Following a meeting of the NFA board of directors at 9 a.m., Monday, June 16, there will be an open meeting of the Association's Plant Food Research committee, to which all those attending the meeting are invited. To be featured at this session is a presentation by the recently-created subcommitte on Chemical Processing and Manufacturing.

Scheduled to appear on this program are George V. Taylor, Spencer Chemical Co., Kansas City, Mo.; Edwin C. Kapusta, NFA, Washington, D. C.; Richard E. Bennett, Farm Fertilizers; F. W. Darner, U. S. Phosphoric Products Div., Tennessee Corp.; Leroy Donald, Lion Oil Co., El Dorado, Ark.; R. M. Jones, Barrett Division, Allied Chemical & Dye Corp.; G. F. MacLeod, Sunland Industries, Inc., Fresno, Calif.; and H. B. Siems, Swift & Co., Chicago.

The first General Meeting, scheduled for 10 a.m. on Tuesday,

HON. KARL E. MUNDT
"Where to in '52?"

ALLAN B. KLINE
"Agriculture—America's Defense"

MILTON S. EISENHOWER
"Framework for Peace"

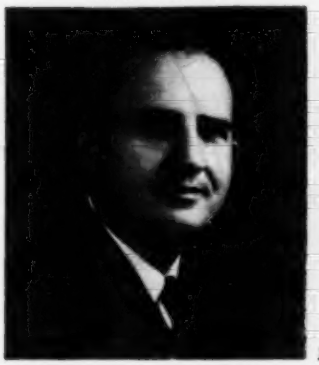
June 17, will include addresses by the Honorable Karl E. Mundt, U. S. Senator from South Dakota, on the subject, "Where To In '52?"; by John H. Stambaugh, Assistant to the Secretary of Agriculture, on "Agriculture—An American Business Opportunity;" and by J. E. Totman, chairman of NFA's board of directors, who will present his annual convention address. At 2 o'clock on the same day, the ladies' bridge party is scheduled.

Tuesday evening has been designated as Festival Night with four major features marking this highlight of the NFA social season. The events will begin at 6 o'clock when International Minerals and Chemical Corporation will offer a Refreshment Hour. At 7 o'clock, a convention dinner will be staged, and at 9 o'clock the nationally famed quartette, "The Skyliners," will present a half-hour of songs and musical novelties. This group has appeared on television, on radio, and in more important entertainment centers throughout the country. Beginning at 11 o'clock, there will be dancing in the ballroom.

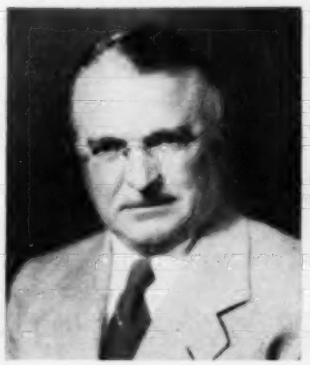
On Wednesday, June 18, the second general meeting will take place when Milton S. Eisenhower, president of Pennsylvania State College, will address the gathering on "Framework for Peace;" Allan B. Kline, president of the American Farm Bureau Federation, will speak on "Our Agriculture and America's Defense;" and NFA's president Russell Coleman will deliver his address.

The following have accepted chairmanships for various convention committees: Mrs. J. E. Totman, Ladies' Hospitality; Mrs. E. M. Kolb, Ladies' Golf; Mrs. J. A. Naftel, Ladies' Bridge; Committee for Golf and Men's Golf Events, R. S. Rydell: Horseshoe Pitching Contest, A. A. Schultz; Tennis, George Burns; Men's Hospitality, Gene Van Deren.

DR. RUSSELL COLEMAN
N.F.A. President



J. E. TOTMAN
N.F.A. Board Chairman



John H. Stambaugh
"Opportunity in Agriculture"

Chemical Control of GRASSHOPPERS

DURING the past six years, experiments have been carried on at the Oklahoma Agricultural Experiment Station to determine the value of different chemical compositions as grasshopper poisons. Laboratory tests were made to establish a basis for the rate of application in field treatments and to measure comparative stomach and contact toxicity. Residual effectiveness was measured by field-laboratory methods.

Each of the compounds discussed in this paper is sufficiently toxic to grasshoppers to give good control if applied by the proper method and in sufficient amounts. The amount which can be used economically per acre is, of course, limited by its relative cost. Thus, a compound such as "Dilan," which is comparatively expensive at the present time and which would need to be used in somewhat greater amounts than the other materials, would not be relatively economical.

A compound which is effective as a stomach poison but has poor contact toxicity may give excellent kill if applied at a time when grasshoppers are feeding. If insect activity is low, due to temperature or other conditions, kill may be very poor.

Many things must be known in order to understand the action of a chemical on insects. Ecological factors are among the more important. Plant conditions affect the extent to which an insecticide is held, the actual distribution, and with temperature, moisture and other factors, the rate of feeding or activity. There are many reasons for erratic control. The more that is learned of ecology and habits of grasshoppers and this correlated with the manner in which a poison acts, the greater will be the effectiveness and economy of control. The interrelationship of different influences becomes less important, however, as the toxicity of a chemical increases. From the standpoint of excellence, an ideal insecticide for killing grasshoppers would have a high contact and stomach toxicity, and a long residual period to take care of newly-hatched nymphs and migrants.

Insecticidal properties of compounds described in this paper are based on tests using economically important species of grasshoppers, principally the differential grasshoppers, *Melanoplus differentialis* (Thomas); the lesser migratory grasshoppers, M. *mexicanus mexicanus* (Saussure); and the two-striped grasshopper, M. *bivittatus* (Say).

Much of the material has already been published[2] in detail. Data shown on the graphs were selected to illustrate certain properties.

Methods of Testing

CONTACT toxicity was measured by placing 10 grasshoppers in a two-quart jar and administering 50 milligrams of insecticide dust with a single puff. Each concentration was replicated several times. After 5 minutes, the grasshoppers were transferred to a cage and fed fresh alfalfa or head lettuce. Mortality readings were made at regular time intervals. In a second method, the abdomen of the test insects was dipped in emulsions.

Stomach toxicity was determined by feeding caged grasshoppers fresh alfalfa which had been sprayed or dipped. A comparison was made of different concentrations and mortality readings were made at regular time intervals.

The speed of kill for the different compounds is not illustrated on the graphs. This varied considerably and a graph designed to compare mortality at the end of 4 hours, for example, would show a different profile. At the end of 72 hours, however, the actual effectiveness of the different materials was clearly shown as the relative results changed but little beyond that point.

Residual effectiveness was measured by spraying or dusting alfalfa in the field. Plants were made available to caged grasshoppers one hour after treatment. Fresh plants

by

Charles H. Brett

Associate Entomologist
Oklahoma Agricultural Experiment Station
Stillwater, Oklahoma

were supplied to them daily from the same plot, with no other food available. Other cages of grasshoppers were started in the same manner 24 hours after initial application. The procedure was repeated after 48 hours, 72 hours, etc. Mortality readings were made on the grasshoppers and when the curve indicated they were no longer being poisoned, the feeding time was added to the time from initial treatment to initial feeding in order to determine the total period of time the compound existed on the plants as a toxin to grasshoppers. This is illustrated in the mortality taper graph. (Page 52)

General Comparisons

DIELDRIN was consistently the most insecticidally active material tested, both as a stomach and contact poison. It also had a longer residual period and killed very rapidly. There was significant evidence that grasshoppers were being poisoned by plants upon which the insecticide was three weeks old. Because of this 3-way effectiveness, dieldrin can be applied at very low rates yet

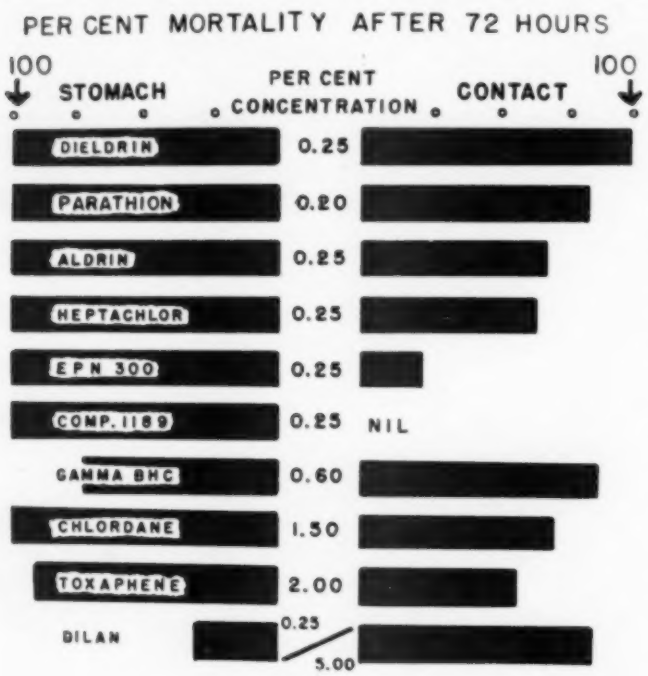
Ground is literally covered with dead grasshoppers following application of two ounces of aldrin per acre in Iran. Material had been applied by plane.

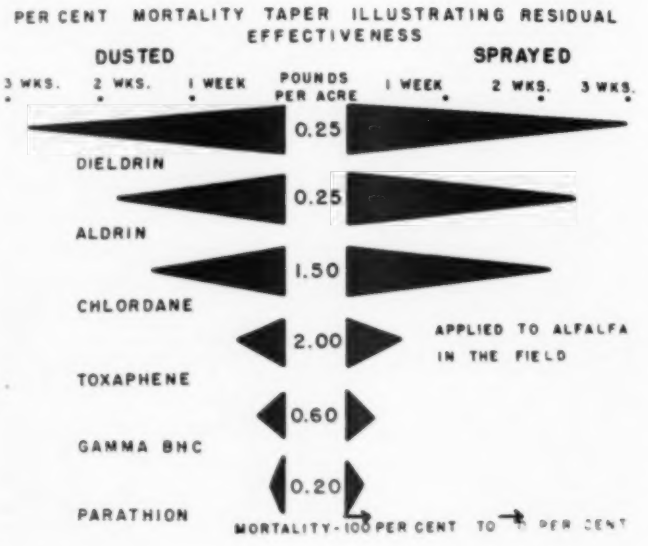
2 Brett, Charles H., R. G. Dahms, Rex B. Reinking, and W. C. Rhoades. Grasshopper control with chemical sprays and dusts. Okla. Agric. Exp. Sta. Bul. B-371. June, 1950.

Brett, Charles H., Milledge Murphey, Jr., and Rex B. Reinking. Grasshopper toxins: a comparison of eleven materials. Jour. Kans. Ent. Soc. 24(3):112-116. July, 1951.

give excellent kill. Evidence continues to accumulate showing that dieldrin at these low rates would be as safe to man and warm blooded animals as many other insecticides.

Parathion was very toxic to the grasshoppers. It killed rapidly and acted both as a stomach and contact poison although it was somewhat better as a stomach poison.





Parathion had a residual period as a grasshopper toxin of only one or two days. This was the shortest time for any of the chemicals tested. It can be used for good economical control at very low rates of application. Its hazard to the operator during application is its chief disadvantage, although if handled carefully, it can be used safely. Best control was obtained when temperatures were above 80 degrees F. Sprays were a little better than dusts.

Aldrin was a very good toxicant. It was most effective as a stomach poison and sprays were better than dusts. This chemical is being widely used for excellent and economical control with low rates of application. Sprayed plants had lost their toxicity to grasshoppers by the end of two and one half weeks.

Heptachlor was comparable to aldrin as a stomach and contact toxin. No data were obtained concerning its residual characteristics, but presumably these would be fairly good. Heptachlor is another excellent grasshopper poison.

EPN 300 was the fastest acting stomach poison tested and was very toxic. Poor results were obtained when it was used as a contact poison at a concentration of 0.25. Results from tests where very low concentrations were used suggested the chemical was gone before grasshoppers feeding on plants obtained a lethal dose. This indicated a short residual period probably comparable to parathion. EPN 300 would need to be used at a higher rate than parathion in order to give comparable results in the field. Erratic results probably would occur unless it was applied at rates higher than 0.25 pound per acre, since it would depend considerably on grasshopper feeding.

Compound 1189 was not fast acting; however, it gave very good results as a stomach poison. It was poor as a contact poison, killing no grasshoppers until rather high concentrations were used. Since it would depend almost entirely on grasshopper feeding it would be expected to give erratic results in the field.

Gamma BHC was most effec-

(*Continued on Page* 135)

AMERICAN PLANT FOOD COUNCIL

PAUL T. TRUITT, APFC President

Plans Seventh Annual Convention

Convention Dates:

June 19-22

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Convention Place:

Homestead Hotel
Hot Springs, Va.

THE American Plant Food Council will hold its seventh annual convention at the Homestead Hotel, Hot Springs, Va., June 19-22, the group has announced. According to Council president, Paul T. Truitt, a record attendance of more than 500 fertilizer manufacturers and leaders in the fields of agriculture, education, research and government is expected at the summer meeting.

Speakers scheduled to appear on the program include U. S. Senator Harry F. Byrd, who will appear at the banquet, Saturday evening, June 21; president Truitt; Prof. C. J. Chapman, Extension Specialist, Soils, University of Wisconsin, Madison; and Dr. H. F. DeGraff, Cornell University, Ithaca, N. Y. Prof. Chapman will discuss "Pasture Improvement by Direct Fertilization" and Dr. DeGraff, "Fertilizer's Relationship to the Food Economy."

The first day of the convention will be concluded with the annual business session at which eight new members to the board of directors will be elected.

Saturday morning's program is scheduled to start at 9:45, with Rep. Harold D. Cooley, N. Carolina, chairman of the House Committee on Agriculture, as first speaker.

Following Rep. Cooley, a panel discussion will be held, on the sub-

HON. HAROLD D. COOLEY
Speaks Saturday Morning

DR. BYRON T. SHAW
To Appear on APFC Panel

SEN. HARRY F. BYRD
Chief Speaker at Banquet

ject of "Major Factors Influencing the Future of Agriculture." Dr. Paul D. Sanders, editor of the *Southern Planter*, Richmond, Va., and widely-known authority on agriculture, will be moderator.

On the panel, in addition to Dr. Sanders, will be Dr. Byron T. Shaw, administrator, Agricultural Research Administration, U. S. Department of Agriculture, Washington; O. V. Wells, chief, Bureau of Agricultural Economics, U.S.D.A.; D. Howard Doane, founder of the Doane Agricultural Service, St. Louis, Mo.; and Herschel D. Newsom, Master, the National Grange, Washington, D. C.

Final speaker on Saturday morning's program will be W. A. Minor, assistant to the Secretary of Agriculture and chairman of the U.S. Department of Agriculture's Fertilizer Policy Committee. The title of his talk is, "We Too Have a Job to Do."

The Plant Food Council has announced that thus far, the following committees for the 1952 convention have been selected:

Executive and Convention Committee: George E. Petitt, Potash Company of America, Washington, D.C., chairman; C. Cecil Arledge, Virginia-Carolina Chemical Corp., Richmond, Va.; John V. Collis, Federal Chemical Co., Louisville, Ky.; C. B. Robertson, president, Robertson Chemical Corp., Norfolk, Va.; John E. Sanford, Armour Fertilizer Works, Atlanta, Ga.; and W. T. Wright, vice-president, F. S. Royster Guano Company, Norfolk, Va.

Golf Committee: Dean R. Gidney, U. S. Potash Company, New York, N. Y., Chairman; Albert B. Baker, Jr., Bradley & Baker, New York, N. Y.; Robert B. Lenhart, G. L. F. Soil Building Service, Ithaca, N. Y.; and W. F. McLane, Lyons Fertilizer Company, Tampa, Fla.

Nominating Committee: Geo. E. Petitt, chairman; C. Cecil Arledge; Luis R. Gonzalez, Ochoa Fertilizer Corp., Hato Rey, Puerto Rico; W. Hampton Logan, Logan-Robinson Fertilizer Co., Charleston, S. C.; Ashmead F. Pringle, Jr., A. F. Pringle & Company, Charleston, S. C.; P. J. Prosser, The Baugh & Sons Company, Baltimore, Md.; John E. Sanford; and Frank S. Washburn, American Cyanamid Company, New York, N. Y.

Tennis Committee: A.J. Dickinson, Virginia-Carolina Chemical Corp., Richmond, Va., Chairman; Benjamin H. Brewster, Jr., The Baugh & Sons Company, Baltimore, Md.; and William J. Rabel, American Cyanamid Company, New York, N. Y.

Below: The Homestead Hotel

Describing the scene as a "Nip and Tuck" struggle, a prominent California scientist pictures the tremendous activity going on in

Agricultural Research

by

Stanley B. Freeborn

University of California
College of Agriculture
Berkeley, California

THE constant battle waged by agricultural research in its attempt to overcome the hordes of problems which threaten defeat to the forces of food and fiber production in this nation and the world, could well be described as a "nip and tuck" struggle.

Agriculture is the one industry producing new wealth each year from nature's bounty of sun, soil, and water, yet strangely enough, its most pressing problems are man-made.

For instance, insect scourges and epidemics of plant diseases are important because of man's concentrations of specific host plants and animals in areas where insects and diseases, geared to scattered plant and animal populations, find mile on mile of their favorite hosts.

Again, labor costs which have caused some of agriculture's biggest problems are the result of a man-made economy.

And again, as man reproduces man, the world's population increases faster than the world's food production in the present ratio of fifteen to nine.

For about fifteen years now, American agriculture has faced "all-out production" demands to meet continuous and expanding need. These demands have been met in the "nip and tuck" battle of research. It does not appear as though American agriculture will ever again enjoy the respites of a stabilized demand.

Let us sketch an outline of today's problems in agriculture:

Food Basic Everywhere

MILITARY mobilization, even though partial, and the demands to avoid a hungry world that would be prey to Communism, create a big increase in food needs. Food is as indispensable as ammunition. Food reserves must be available immediately, not only to our own forces but to those of our allies in all the places where trouble may follow hunger. Food must be ready for shipment; in transit on land and sea; available in overseas depots; and in sufficient quantity to provide margin for war losses.

Increased civilian demand reflects both the increase in population in the United States and the increase in per capita consumption for certain types of food. Together they show how much greater is agriculture's present task. United States population has increased by twenty millions since 1940, or at the rate of two

Presented at National Agricultural Chemicals Association Spring Meeting — Fairmont Hotel, San Francisco, California, April 9, 1952.

millions a year. Civilian per capita food consumption is thirteen percent above the 1935-1939 average. Mobilization makes abundant food supplies imperative. A strong and healthy people are the first line of defense.

In this nation's entire effort to stem aggression and help the free peoples of the world to work for prosperity and peace, food is an indispensable weapon. It is the basic instrument in our foreign policy. Our volume of agricultural exports is up fifty percent over the 1935-1939 average. 1951 export demands required production from approximately fifty million acres,—about one-sixth of our total cultivated crops.

Ever since the North Korean forces crossed the 38th parallel in mid-1950, our food reserves have dwindled. Cotton, corn, and wheat carry-overs are all down.

The disappearance of food and fiber surpluses must be made up by further expansion of production. The rising level of farm output contrasts strikingly with a negligible increase in cropland acreage, and a declining level of animal power and farm workers. With little additional cropland available, we must concentrate largely on retrieving new acreages or on making existing acreage produce more abundantly.

In addition to improved cultural practices, better crop varieties and livestock breeds, agriculture's achievements in the past decade have been highly dependent on research along three principal lines,—mechanization, fertilization, and chemicalization. These are largely responsible for moving agricultural output upward. Agriculture must continue to rely heavily on these. They are effective weapons in the "nip and tuck" battle of increased agricultural production on existing acreages.

"Man" Biggest Problem

ANOTHER problem facing those engaged in agriculture, and all who receive its benefits, should be brought out here and now.

If the question were put to those of us who have spent our lives in agricultural research, "What is the most frustrating problem you have ever attempted to solve?", my answer would be, "Man!"

The term "man" is an oversimplification and too all-inclusive. For instance, there are the informed and uninformed, the intelligent and the unintelligent, the dealer in fact and the dealer in fiction, the apostle of truth and the purveyor of "hearsay."

The agricultural scientist has a major problem in the man who shuts his eyes and ears to the findings of sound, substantiated research. A secondary problem of the research scientist is one of his own making. Under the compulsion of urgent demand in his search for facts, he is so engrossed that he often fails to devote part of his time to the examination of unintelligent man-made interference which retards scientific progress.

For some several months possible harmful effects of residues of agricultural sprays and dusts on food products have been studied by the "Select House Committee on Use of Chemicals, Pesticides, and Insecticides in and With Respect to Food Products."

Responsible sources have reported that during hearings little or no attention has been paid to all the available sound research data on the subject, and that presently existing legislation designed to protect consumers from any possible harmful effects of residues of agricultural chemicals has also been ignored. I am also informed that in certain local areas, due to the sensational and one-sided handling of the hearings, consumers have been scared into refusing to buy certain foods in fear of chemical residue poisoning; a general wave of public feeling is being created to the point where the American Federation of Women's Clubs passed a resolution recommending the adoption of the Miller Bill and is aggressively pressing its passage; mail from other women's organizations indicates a public scare; and that the National Research Council received many critical letters to its highly technical and sound report on the subject under investigation.

Before we examine the vital necessity of chemicals in agriculture let me quote a statement from the National Research Council report just mentioned. The Council, inaugurated in 1916 under the Congressional charter of the National Academy of Sciences, provides an *independent* cooperative body of *scientific* counselors to the Government. Highly responsible members of committees and boards serve without pay. The Food Protection Committe of the Council reports,". . . . there is no evidence that consumption of foods resulting from the use of the new chemicals in crop production or in the processing of foods has created mysterious disease epidemics or endangered the health of the people.

Closely allied to this movement to discredit the use of chemical tools in agriculture, but by no means as dangerous, is another fad activated by an urge for notoriety which impugns the use of chemical fertilizers. The "humus farmers" who glorify the utilization of "organic" fertilizers in the form of manure and compost (as well as fish worms), in contrast to the application of inorganic commercial fertilizers have, of course, little influence on successful farmers. Their disciples are generally working on such a small scale that they don't know whether they are successful or not, but their voices are always added to the swelling chorus which attacks anything "unnatural" such as inorganic or synthetic fertilizers, insecticides, or chemical soil amendments. They have just enough truth in their arguments to fool the gullible. It is true that organic material contains a great variety of chemicals essential to plant growth and that the incorporation of organic material improves the physical condition of the soil and supplies a medium of growth for soil organisms which act on the soil nutrients to make them available to the plants. In some favored areas of rich soil fertility it is very possible that the restoration of natural humus might produce satisfactory crops for a series of years. However, it is doubtful if any soil could be kept at its original productive capacity over

a period of years except by the addition of abnormally large amounts of manure.

"Muck" soils known to consist of from thirty to fifty percent organic material should be the bonanza of every "humus farmer." Here he could raise, according to reports from the Michigan State College, 97 bushels of potatoes per acre on the affluence afforded by nature in the form of peat soil, but if he were not afraid of being poisoned by the addition of chemical fertilizers including phosphorus and potash, his yield would be increased by 600 bushels per acre.

In modern agriculture, wise and competent use of chemicals is of prime necessity and unavoidable. Time permits only a few examples of how this comparatively new agricultural tool is helping meet the heavy and increasing demand for food and fiber in problems of cost, mechanization, manpower, and greater yields.

Within the last ten or fifteen years, chemistry has changed agricultural production and introduced a new labor-saving farm economy. We are all conversant with the term "mechanization." Hand in hand with mechanization is a relatively new force, *chemicalization*. The efficiency and versatility of chemicals in many important fields of agriculture cannot be denied. They are able to increase and improve the crops and animal products. They are being used to protect fruits and vegetables from damage during transit and storage, to hasten the ripening of fruits or to delay the blossoming of trees against frost damage, to control insects, nematodes, fungi, and plant diseases.

Annual losses in the United States caused by insect pests are estimated at about four billion dollars, and losses due to fungi and other plant diseases at another four billions. Recent annual estimates of total weed damage are as high as five billion dollars. Thus, about thirteen billion dollars total damage accrues annually to our agricultural production, which in 1950 had a total dollar value of thirty-one billions. Consequently, the total damage caused to our agriculture by insects, fungi, plant and animal diseases and weeds was about forty-two percent of the gross production in 1950. Scientists agree that a great part of all these losses could be averted by systematic and comprehensive use of insecticides, fungicides, rodenticides, and herbicides. However, it is understood fully that these figures apply only in a sellers market. Otherwise the introduction of salvaged products would depress the market price and change the percentages markedly. However, the products were lost to the people regardless of their value.

Chemicals Indispensable

TODAY, the production of agricultural chemicals has become a vital factor in our national economy, as these products are indispensable for the protection of our crops and livestock, and the health and welfare of our entire nation.

Labor savings in farm operations through agricultural chemicals cannot be isolated under one heading since they also act in conjunction with agricultural mechanized equipment, including the airplane. Mechanization, for instance, in cotton harvesting, would not have been so successful without the development of defoliating agents and conversely many of the chemical aids would have been laboratory demonstrations without the development of mechanical gadgets designed for their application.

The mechanization of agriculture has been a relatively slow-growing child although it has assumed giant proportions. In 1850 each laborer in the agricultural field in the United States had at his command 1.8 horse power of additional energy (and that means exactly what is says -or possibly mule-power). One hundred years later in 1950, each worker could command 33 horsepower and very few of them walked on four legs.

Striking as this development is, it is being eclipsed by the chemicalization of agriculture. In my college days we could count the insecticides of value on our fingers. Only last month, at a committee meeting made up of the leading manufactures of the area and researchers in insecticides, some chemical compounds in actual use as insecticides had to be explained to many of the group present. And insecticides are comparatively static as contrasted with the herbicides and plant hormones. We started with compounds that sterilized all growth; then we found substances that destroyed broad-leaved vegetation but to which the grasses were immune; now we have selective killers that will pick out the unwanted grasses and leave the beneficial ones; we have pre-emergence and post-emergence herbicides and those that specialize on brush; we have sprays that will keep apples on the tree and those that will thin them selectively to the proper number that will insure the maximum crop. We have chemicals that will produce figs without caprification and by choosing the chemical, we can have them with or without seeds .

Basically, chemicalization, like its twin, mechanization, finds its greatest justification in reducing the output of energy required to produce or exceed a given goal. We are proud that a turn of a switch or the effortless control of a mechanical gadget will replace the aching muscles and bowed backs of agricultural laborers. We would be less than realistic, however, if we failed to recognize that without these labor-saving devices, our American agriculture would be out of business or reduced to peasantry from a purely economic reason.

Someone has figured out that in sugar beet production, with the aid of land-leveling equipment, decorticated seed, precision planting, pre-emergent weed control and mechanical harvesting, that beets sufficient to make a hundred pounds of sugar can be produced and harvested with an expenditure of twenty five minutes of manpower. With the methods available to us thirty years ago, two hours of labor would have been required to produce the same amount

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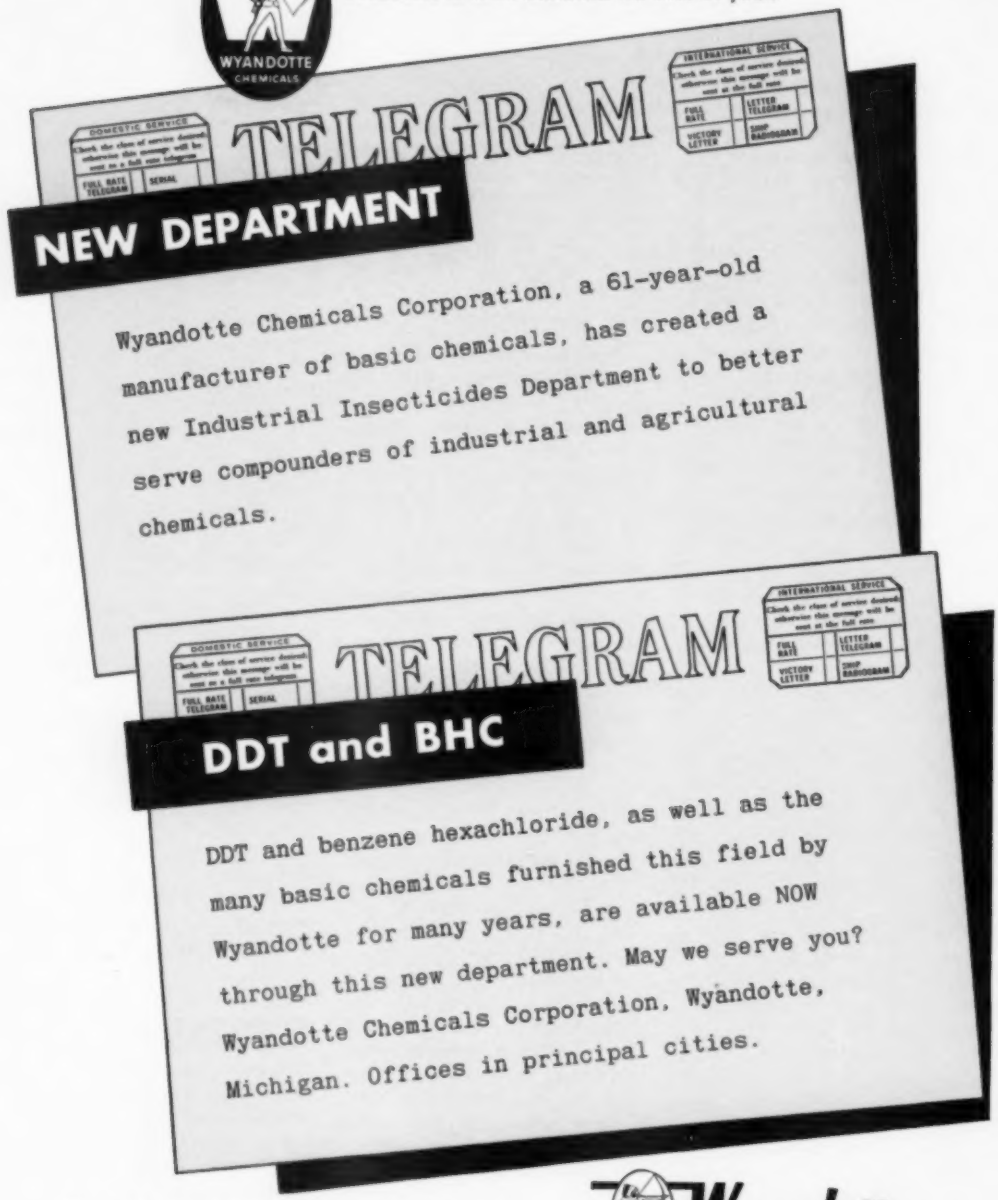
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Many Phases of Pesticides Discussed in St. Paul by North Central Branch, AAEE

PANEL discussions of insecticides and residues highlighted the seventh annual conference of the North Central States Branch of the American Association of Economic Entomologists, held March 27-28 at the Hotel Saint Paul, St. Paul, Minnesota. About 300 registrants participated in the meeting, which featured sessions on fruit insects, insects of forage and grassland, insects of man and domestic animals, insects of cereal crops, stored products pests, and insects of vegetables and canning crops. The meeting ended with an election of officers at which T. H. Parks, Extension Entomologist of Ohio, Columbus, was elected president, succeeding R. C. Smith, Kansas State College, Manhattan, who will automatically serve on the board.

Paul Dahm, also of Kansas State College, was elected vice-president, succeeding J. H. Lilly, Iowa State College, Ames, and J. W. Apple, Univ. of Wisconsin, Madison, was re-elected secretary-treasurer. In a report on "How Insecticide Controls Affect the Manufacturer", W. E. McCauley, Julius Hyman & Co., Denver, told the Association that the proposed additional controls on the manufacture and use of the agricultural chemicals may mean a sharp decline in research on new products. He said that pesticides already are controlled by numerous laws and by several agencies of government, and that adding more control is a threat to the nation and to "the pioneering aggressiveness upon which America is built." Furthermore, government proposals for more control of chemicals have made the public unnecessarily afraid of chemicals and of foods on which the chemicals are used.

The technical aspects of insecticides and insecticide residues were considered in two panel discussions on this subject. In reporting his findings for "Residues on Corn Following Treatments for European Corn Borer," J. E. Fahey, U. S. Bureau of Entomology & Plant Quarantine, Vincennes, Ind., pointed out that the magnitude of DDT spray deposits is a function of the degree of development of the corn plant, as well as the formulation of toxicant employed. Small corn plants, since they contain a greater surface area per given weight of plant, will retain a greater residue (ppm of DDT) than the larger plants. Growth of the plant is an important factor in the dilution of the residue. Still another important factor, in considering residue, is the loss of DDT due to weathering. Mr. Fahey said also that wettable DDT formulations do not deposit as great a residue load as emulsifed oil solutions of DDT, when used in comparable concentrations.

J. M. Bann, Illinois Natural History Survey, Urbana, reported on the studies of the magnitude of initial deposits per application dosage, rate of loss, length of residual life, and approximate duration of insect toxicity of insecticidal residues on legume crops (alfalfa, red clover, sweet clover, and soybeans), at specified dosages. These studies indicated that aldrin is least persistant, followed in

North Central Officers at Minnesota Meeting

Seated (L to R): C. R. Neiswander; T. H. Parks, extension entomologist of Ohio, Columbus, newly-elected president of branch; and J. W. Apple, Madison, Wisconsin, who was re-elected secretary-treasurer of the group.

Standing (L to R): J. H. Lilly, Iowa State College, Ames, retiring vice-president; and R. C. Smith, Manhattan, Kansas, retiring president who now becomes a member of the NCAAEE executive board.

order by chlordane, dieldrin, toxaphene and DDT. The application dosages (in pounds per acre: ¼, 1, ¾, 1½, 1½, respectively) were found to result in an initial deposit which had a persistance not exceeding the following periods: aldrin, 21 days; chlordane, 28 days; dieldrin, 28 days; toxaphene, 42 days; and DDT, 56 days. Mr. Bann continued by reporting that biological assay studies of deposits on legumes indicated that aldrin, chlordane, and dieldrin are toxic to houseflies as long as any chemically detectable amount of residue remains on the surface. Both DDT and toxaphene deposits were found to persist at high levels for several weeks after the disappearance of all insecticidal activity.

Drift is Discussed

ACCORDING to C. J. Weinman, Natural Hist. Survey, Urbana, Ill., "one of the most highly underrated factors in evaluating residues is contamination." He indicated that even when spraying is done in little or no wind, there may be measurable drift for seven to ten rows of an orchard, beyond the last row sprayed. He said also that drift and contamination are to be correlated with the physical properties involved: the less volatile the insecticide, the farther it will drift, and the longer it will remain as a contaminant after it is deposited. The temperature, and wind velocity to which the deposit is subjected should also be taken into account.

He also reported that the rate of residue loss is independent of original deposit. That is, within the limits of practice, a residue of a given compound will be at zero level within a given time after application, regardless of the amount of material present at spraying. Until the complete disappearance of residue, however, deposits will be directly proportional to the original levels.

In a panel discussion of the newer insecticides, L. K. Cutkomp, Univ. of Minnesota, Minneapolis, reviewed the hydrocarbons, reporting that neither dieldrin nor aldrin is toxic to most plants even in high doses. Applications of 2,4, or 8 pounds per acre had little impression on the plants. He said that "Compound 69" (Shell Chem. Corp. product) is similar to dieldrin, but is more toxic to humans. Heptachlor is effective on grasshoppers in applications of about ¼ pound per acre, and against wireworms at 10 pounds per acre; it is safe to plants at high doses. According to Dr. Cutkomp, "Dilan" is compatible with most agricultural chemicals, is not as toxic to rats as DDT, and is effective against cabbage worms, leaf hoppers, and grasshoppers. It is not effective against thrips and aphids. His studies also indicated that "Geigy 208" has about the same level of toxicity to animals as rotenone, is good as rotenone against flies and green apple aphid, but is ineffective against the potato aphid or alfalfa aphid.

The following advantages of phosphate insecticides were listed by P. A. Dahm, Kansas State College, Manhattan, in a review of these compounds: (1.) they are free of poisonous residues, which may be correlated with their tendency to hydrolysis and condition of increasing alkalinity; (2) the residues are not dangerous to mammals; (3) there is an absence of resistance to these compounds; and (4) good analytical methods are available for testing these compounds. One of the main disadvantages is their toxicity, and consequent problem of safe handling.

W. W. Abramitis discussed the activity of several new systemic insecticides, particularly "schraden" (OMPA) which technically is O,O-diethyl-O-2 (ethyl mercaptoethyl) thiophosphate; "isopestox"; "systox" (or compound "E-1095"); and "C.R. 409."

He said that schraden is effective when applied either as a spray, aerosol, in soil or seed treatment. It should be applied to vigorously-growing plants and is particularly effective against a large number of aphid species and resistant and non-resistant spider mites. It is reported to persist in soil up to 36 days. One application of "schraden" was found adequate to keep cabbage aphid-free all summer, while repeated applications of parathion or para-oxon were necessary to control this same pest.

Mr. Weinman continued to say that "isopestox" and "C. R. 409" killed beneficial insects as well as the pests when applied as a spray, but could be made to act selectively when applied to the soil of growing plants. Systox was found to be about as toxic orally as parathion, but more toxic when absorbed through the skin.

A new approach to the study of insecticides was presented in a report on "Absorption and Translocation of Insecticides in Plants" by T. C. Allen and J. E. Cassidy, Univ. of Wisconsin, Madison, Wisc. The function of the plant was stressed, as Mr. Cassidy pointed out that the plant may reduce the effectiveness of insecticides, or may convert them to more toxic compounds. Absorbed materials may be translocated to edible portions, making them toxic or possibly tainting their flavor. Crop yields may be reduced if the insecticide penetrating the plant is phytotoxic. On the other hand, he said that the absorption and translocation of an insecticide by the plant may protect it from insect ravages. The degree to which each new insecticide may be absored, translocated and metabolized by the plant may be studied by the use of radioactive tagged chemicals in conjunction with specific microchemical analyses.

Studies of parathion have indicated that this insecticide kills a variety of insects on aerial plant portions when applied to the soil. Chemical alteration of absorbed parathion has been noted for citrus fruits, but the nature and toxicity of the products is not known at present. Parathion and its oxgen analog may be translocated up or down in plants in insecticidal amounts.

Mr. Cassidy continued to discuss the various other insecticides, including fumigants, oils, inorganics, natural botanicals, synthetic organics, chlorinated hydrocarbons, and the organic phosphates. It was interesting to note that the systemic insecticides are absorbed and translocated by actively growing plants in sufficient amounts to kill insects feeding at a site distant from the point of application. Mr. Cassidy indicated

however, that commercial use of the present phosphate systemics is restricted because of the unknown status of their mammalian toxicity when present in plant tissue.

Still another report along new research lines was presented by L. Haseman, Univ. of Missouri, Columbia, Mo., in considerig the question "Is the Chemistry of Soils a Better Way to Control Insects?" Dr. Haseman reported that studies of certain aphids, flea beetles, grasshoppers, crickets, greenhouse thrips, chinch bugs, red spiders, white fleas and some other insects, indicated that different insects can be harmed or helped by changes in the mineral nutrient content of their food. However, the effects of different mineral nutrients and other foods, and growth elements in insects' diets has still to undergo considerable study before any definite or even general recommendations are made on use of fertilizers and other soil rebuilding practices as effective controls for insects.

Application Methods

AT a session concerned with insects of domestic animals, H. Gunderson, extension entomologist, Iowa State College, Ames, Ia, presented a report on "Low Pressure Sprays for Livestock Insect Control." He indicated that the high-pressure spray method for control of cattle grubs, lice, sheep ticks, etc., although effective, has not been adopted widely because of the expense involved.

A method in which low pressure sprays could be used with satisfactory control of livestock pests consists of using a wetting agent in the insecticide spray, to accomplish essentially the same thing that the high pressure spray, or complete immersion might do. This method permits the material actually to penetrate the hair or wool to the skin, so that the insecticide can be brought into intimate contact with the skin. About two pounds of wetting agent (ordinary household synthetic detergents may be used) per 100 gallons of spray are sufficient.

To simplify livestock spraying further, "A Device for Spraying Cattle Automatically" was described by its inventor, W. N. Bruce, Natural History Survey, Urbana, Ill. The unit consists of a container of insecticide with spray pump attached to a frame at 47 inches from a treadle, which when depressed, acts through a lever and connecting rod to release the insecticide. The unit can be made with two sprayers, the other being attached about 16 inches above the treadle, and serving to spray the underside of the livestock.

Mr. Bruce pointed out that the sprayer should be placed in a chute or runway through which cattle must make at least three round trips a week. He said it could be located in a fence between pasture and water or salt, or in a lane between pasture and milk barn. As the animal steps on the treadle, the spray is applied to one side and as it makes its return trip, the other side is sprayed. Solutions containing one per cent pyrethrins and 10 per cent piperonyl butoxide have been found satisfactory in the automatic sprayer.

In a session dealing with reports on fruit insects, C. J. Weinman, Natural Hist. Survey, Illinois, pointed out that only the red mite and the two-spotted mite are normally abundant enough in midwestern orchards to cause economic damage. According to D. W. Hamilton, U.S.D.A. Vincennes, Ind., the use of DDT sprays in orchards resulted in increased mite infestations, which he said could be due to the killing of mite predators. Use of lead arsenate and nicotine bentonite had no effect on the predators.

A summary of acaricides for use against the European red mite was presented by C. R. Cutright, Ohio Agric. Experiment Station, Wooster, who pointed out that EPN is first among the recommended materials in Ohio, having good residual action, and is highly effective against living mites. He continued to say that the systemics have not shown much promise; the summer oils at doses high enough to be effective, are injurious to both foliage and fruit; rotenone compounds, although effective are expensive; TEPP is fairly effective but has no residual action; di-methyl-carbinol ("Dimite") is a safe and effective acaracide; and parathion is effective against mobile mites, but has little residual action.

In reporting some findings on the control of the sweet clover weevil, C. R. Weaver, Ohio Agricultural Experiment Station said that BHC or toxaphene in the early spring is recommended as the most practical and efficient method of controlling spittlebug nymphs. J. H. Bigger, U.S.D.A., Urbana, Ill., reported that control of sweet clover weevil in Illinois is effected by spraying with DDT, .5 pounds per acre, or toxaphene at 2 pounds per acre. Treatment is recommended only when at least 50 per cent of the leaf surface has been destroyed.

In opening the preliminary business session, president Smith pointed out the importance of the twelve north-central states, which he referred to as the "granary of the United States." He said that more than 48 per cent of the nation's grain and mill products were produced in the north-central states in 1947, and that a large amount of farm machinery is used in this area. Following these remarks on the general status of north central states, Dr. E. F. Knipling, president of American Association of Economic Entomologists, Washington, C. C., pointed out the importance of consolidating the society. In particular, he indicated that it might be advisable to change the name of the society from "American Association of Economic Entomologists" to "Association of Entomologists;" second that a full-time, paid, executive secretary might be employed to devote his entire interests to the society; and that an executive committee be appointed, representating the different phases of entomology.

In a later business session, Dr. W. E. McCauley, Julius Hyman Co., Denver, chairman of the resolutions committee, requested that the society ask the National Association to appoint a committee which would assemble, evaluate, and distribute current information on legislation concerning pesticides, insecticides, etc. It was resolved also that the association

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Should Pesticides be Mixed With FERTILIZERS?

by

F. L. Bentz Jr.

Extension Soils Specialist
University of Maryland

IN recent years, the practice of incorporating materials other than the major and minor plant food elements in commercial fertilizers has developed problems of great interest to plant scientists, fertilizer manufacturers, state control officials and others. This paper refers to the use of many of the new organic chemicals as insecticides, fungicides and herbicides in mixed fertilizers.

Results of some experiments along these lines have been of spectacular nature, stimulating great interest. For example, in some fields in Carolina, almost complete destruction of the corn crop by the Southern corn root worm occurred where ordinary fertilizer was used, but where chlordane was added to the fertilizer, a 30-90 per cent increase in stand resulted. Not all experiments have been so highly successful, as when BHC was used in fertilizer for white potatoes, with the resultant transmission of highly undesirable flavor to the potato tuber.

Experiments and experiences of this kind have led to many problems which affect fertilizer recommendations. Before we discuss these problems let us first look briefly at some of the developments in this field.* These advances should help to point out not only the problems which arise but also point to the possibilities which exist.

Fertilizers as Pesticides

UNDER certain conditions, some fertilizer materials can act as weed killers, insecticides or fungicides.

Fertilizer Materials as Weed Killers. Water soluble salts may kill plants when applied to their foliage either as a strong solution or as a fine dry powder, provided the application adheres to the leaves. Finely powdered kainit has been used for many years in Germany to destroy weeds and simultaneously to fertilize cereal crops. In the British Isles, ammonium sulfate solution is sprayed on winter grain crops for similar purposes.

Ammonium nitrate, ammonium sulfate, sodium nitrate, calcium cyanamide and urea have been used to fertilize seed beds for permanent turf such as lawns and golf greens, and at the same time to render them comparatively weed-free. Calcium cyanamide has been used as a dust or in granular form over newly-planted onion seed, potatoes, peas, asparagus and corn to control weeds and also to fertilize the crop. It has been used in tobacco plant beds in the fall with a resulting decrease in weeds the following spring and an improvement in plant growth. North Carolina now recommends a 16-8-2 fertilizer containing one-fifth of the nitrogen in the form of calcium cyanamide for use on tobacco seed beds.

Fertilizers as Fungicides. Urea, sulfur and some minor element fertilizers also have fungicidal properties

*For a more complete discussion of developments in this field see "Combination Fertilizers and Pesticides" by A. L. Mehring, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. D. A., Beltsville, Maryland.

in some cases. Heavy applications of urea have reduced infections of plants with fungous diseases in tobacco seedbeds. Urea added to insecticide sprays for the purpose of foliar feeding of apple trees reduced apple scab infection.

Pesticides as Fertilizers

CERTAIN materials used primarily for the purpose of controlling weeds, insects or plant diseases, also supply plant nutrients. Potassium cyanate and ammonium sulfamate act as weed killers for some plants when applied in solution. However, in the soil they are decomposed and furnish nitrogen and potash for plant growth. They cannot, therefore, be applied in fertilizers in the soil and still act as weed killers.

Bordeaux mixture, lime — sulfur and other fungicides supply minor elements, such as calcium, sulfur, copper, manganese, boron and zinc. Borax serves as a weed killer, fungicide and as a minor element in fertilizer.

The organic phosphorus insecticides such as parathion, tetraethyl pyrophosphate and octamethyl pyro phosphoramide, applied at high rates of application have produced substantial increases in plant growth because of the phosphorus added to the soil. Since most insecticides of this type are applied at a rate of only a few pounds per acre, they can have but little importance as plant food.

Combinations Now in Use

SINCE fertilizers and pesticides can be used for multiple purposes and since there is a possible saving of labor by combining two or more jobs, the use of combination fertilizers and pesticides has developed rapidly. The following paragraphs discuss mixtures already in use:

Herbicides in Fertilizer. One of the most effective and most selective weed killers is 2,4-D. Experiments in France and elsewhere showed that grain yields were increased by applying 2,4-D in mixed fertilizer at planting time. Yields of beets and oats have been increased in the same way. 2,4-D is used in some lawn fertilizers now on the market.

Insecticides in Fertilizers. The chlorinated hydrocarbons, DDT, BHC, lindane, chlordane, toxaphene, methoxychlor, aldrin, and dieldrin are effective soil insecticides and have been recommended for inclusion in fertilizers for some crops. DDT, for example, has been used to kill Japanese beetle grubs in the soil. However, it has already been mentioned that off-flavors and other undesirable effects on some crops have been produced by this group of compounds when added to the soil.

In South Carolina and other southern states, the sand wireworm causes severe damage to seedling corn, cotton, peanuts, field peas, soybeans, and truck crops. Except by rotating crops on the land, farmers have had no method of avoiding this damage. M. D. Farrar of Clemson College, reports that early experiments with BHC and later with chlordane, aldrin, and dieldrin, demonstrate that this insect can be controlled at very low cost by ¼ lb. of BHC or ½ lb. of chlordane per acre applied in mixed fertilizers. Insufficient tests with aldrin and deildrin indicate they are effective in amounts not to exceed the above. Larva of the Southern corn rootworm also attack many seedling crops on the more fertile soils. Farrar reports that recent tests using 1 lb. of chlordane per acre in the fertilizer mixture, have shown from 30-90% increase in corn stands due to control of the insect.

Fungicides in Fertilizers. Many fungicides have been added to fertilizers and tested in experimental work. The fungicides used include various mercury compounds, copper -8- quinolinate, 8- hydroxyquinoline benzoate, sulfur, "Fermate," "Dithane," and "Arasan." In some cases, better results have been obtained with mixtures than when fertilizer and fungicide were applied separately. A lawn fertilizer now on the market contains phenyl mercuric acetate and is recommended for the control of fungous diseases of grass.

Multiple Purpose Fertilizers. *Mehring reports a commercial lawn fertilizer that includes chemicals to control both weeds and insects. It is a 7-5-5 mixture containing 1 per cent 2,4-D and 0.25 per cent lindane. He also reports that an even more complex mixture is said to consist of grass seed, compost, chemical fertilizer, chlordane, milky-disease spore dust, a fungicide, a crab grass killer, and a weed eradicator.

*See previous footnote.

Advantage of Combinations

IT can be seen clearly that there are many advantages in applying pesticides in combination with mixed fertilizers. These advantages are listed below:

1. Such combinations save labor by completing two or more jobs in one operation.
2. No extra equipment such as spraying or dusting equipment is necessary.
3. Danger of damage to nearby plants from spray carried by the wind is eliminated.
4. The pesticide is uniformly distributed in the root zone of the plant when applied in mixed fertilizers. Even though the fertilizer is applied in bands, some of the pecticides now in use can diffuse through the soil and perform their special tasks.

Problems of Combinations

ALTHOUGH the above-mentioned advantages exist and in spite of the fact that highly satisfactory results have been obtained in specific cases, combination of pesticides with fertilizers has created many problems. Important among these are the following:

1. Compatability of pesticides and fertilizers. Marth and Hardesty have concluded that it would seem possible to manufacture fertilizers containing 2,4-D and store them for periods as long as 10 months without serious loss of selective weed killing potency of the 2,4-D.

The chlorinated hydrocarbons are reported to be compatible with ordinary fertilizer materials when stored at normal temperatures. However, all of them, except aldrin and dieldrin, are inactivated by alkalis at ordinary temperatures. At higher

temperatures, they are much more easily decomposed or volatilized. DDT decomposes rapidly at 70° C or at lower temperature in the presence of certain iron compounds. Since the temperature of mixed fertilizers may exceed 100° C when ammoniated, it is obvious that addition of pesticides must be made after ammoniation.

Fertilizers containing chlordane have been stored for 30-60 days without serious breakdown of chlordane. Dieldrin may be expected to stand for longer periods in fertilizers because of its stable nature. Both the gamma isomer of BHC, and aldrin may be expected to have relatively short life because both have relatively high vapor pressures.

2. Mixing Pesticides With Fertilizer Materials. Blending of a few pounds of pesticide with a large amount of fertilizer will require much time and care. The amount of added chemical is so small that it can be lodged in a portion of the batch and the rest left without any of the material. Preblending the pesticide with a small portion of the batch and then adding this partly diluted mix to the rest of the batch will partially solve this problem.

In addition to the mixing problem, the manufacturer will be faced with the necessity of cleaning the mixing unit thoroughly after addition of some materials such as 2,4-D because of its high toxicity to economic plants other than grasses.

3. Labelling. Fertilizers containing pesticides must be carefully labelled and such labels must contain specific instructions for proper use of the mixture. Otherwise, manufacturers may be liable for damage resulting from improper use or use on the wrong crop. Mixtures of this type must also conform to requirements of the economic poison laws and fertilizer laws of all states in which they are offered for sale.

For fertilizer mixtures containing chlordane, the South Carolina fertilizer law requires that each bag be marked with a red tag containing the following information:

This fertilizer mixture contains ————pounds Technical Chlordane per 100 lbs. Due to limited research information there is no general recommendation for the inclusion of organic insecticide in fertilizers. Observations of experiments and result demonstrations indicate its use under corn for control of the sand wireworm and the Southern corn rootworm in certain counties in South Carolina has apparently been satisfactory.

This information is available only for the corn crop. Odor, taste contamination, and other damage may result from the use of organic insecticides on certain other crops.

4. Rate and Time of Application. Rates of application of fertilizer vary not only from state to state, but even more so between individual farms. Application of fertilizer at rates higher than the expected rate may cause the application of too much pesticide and result in damage to crops.

Another difficulty arises because the best time to apply the pesticide does not always coincide with the best time to fertilize. For example, the best time to apply 2,4-D for weed control in lawns does not coincide with the best time to fertilize.

5. Stability and Accumulation of Pesticides in the Soil. Of great importance is the problem of stability and accumulation of pesticides in the soil. The stability in the soil should be such that the chemical accomplishes the purposes for which it is intended and yet leaves no residue that will be toxic to the crops to be grown. As used now, insecticides are applied in fertilizers at levels well below the level used with the same chemical against foliage eating insects. Repeated applications, however, may produce residual toxicity in the soil.

DDT is very stable and large accumulations in the soil may be detrimental to plant growth. With the exception of toxaphene it appears that other chlorinated hydrocarbons also persist in the soil for long periods of time. Toxaphene is reported to be slowly broken down by bacteria and fungi. Other experiments have indicated that 2,4-D loses its herbicidal properties in the soil within 80 days.

It is possible that some pesticides may be taken up by forage and food plants and cause injury to animals and man. Even if not taken up by plants, the chemicals may cause off-flavors and other effects not noticeable until the plants are harvested.

6. Increased Cost. Special mixing, plant cleaning after addition of pesticides, special labelling and additional cost of pesticides, all lead to increased cost of fertilizer to the farmer. The fact that the manufacturer has to produce two different fertilizers of the same grade — one with pesticide and one without it— means additional cost in itself.

Where fertilizer containing a pesticide is applied in bands to row crops it may be necessary to fertilize an entire field with the mixture even if only a small part of the field actually needs the pesticide treatment. This, of course, means waste of fertilizer and increased cost of crop production.

For these reasons it will be necessary for the farmer and for those persons making fertilizer recommendations to balance carefully the cost of applying pesticides in fertilizers against the cost of applying by other methods.

Summary

Pesticides can be used in combination with mixed fertilizers for certain specific purposes. However, careful research must precede any recommendation of such mixtures for general use. This research must determine not only the effect of these combinations on soil and crops, but must also determine whether the fertilizer medium of application is economically sound.★★

Pesticide-Fertilizer Mixtures should be used only for specific purposes and then only after careful research studies

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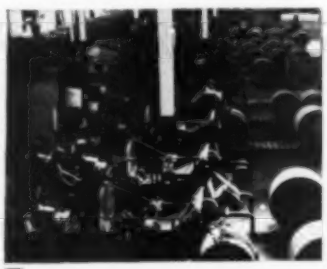

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Bermuda's Cedars Threatened While Entomologists Seek

Insect Control Chemicals

by
Alan G. Dustan
Department of Agriculture
Paget East, Bermuda

THROUGH history, the native cedars *Juniperus bermudiana* L. have been Bermuda's most treasured inhabitants. They have served the population in a great variety of useful ways, as well as adding charm to the landscape. Until very recent times, they were looked upon as being almost indestructible, but a few years ago some of the trees were noticed to be deteriorating. At first, the cause of this was not recognized, but, in 1944, T. A. Russell found trees in the Tucker's Town area of Hamilton Parish infested with a scale insect. This was determined as the Oyster Shell Scale, *Lepidosaphes newsteadi* Sulc. and was looked upon as the cause of the discoloration previously noticed among a percentage of the cedars.

Soon after the Oyster Shell Scale had been recognized, there appeared a more potent enemy which spread quickly from the centre of the Island in all directions. This devastating scale insect, the Juniper Scale *Carulaspis* visci (Shrank) was discovered by W. R. Evans, Director of the Department of Agriculture, within half a mile of the Agricultural Station in Paget Parish, which was to become the focal point where control measures against the offending scale insects were instituted on a very high priority. This scale, as well as the Oyster Shell Scale, was an intruder, having been introduced into Bermuda on imported nursery stock.

Despite the fact that these insects were not at the outset looked upon as being of any great importance, the infested trees were kept under close observation by officers in the local Department of Agriculture and it soon became evident that the condition was spreading, and that rather rapidly. By the summer of 1946, the infestation had extended half a mile from the point where the scale insects had first been discovered and was fast fanning out toward the east following the direction of the prevailing winds. The situation now began to look serious.

The first effort in an attempt to gain control over these damaging insects was through the use of insecticides. Both T. A. Russell and Dr. J. M. Waterston, who had served successively as plant pathologist in the Bermuda Department of Agriculture, concentrated their energies on chemical control. Many chemicals were tested against these insects. In the first instance, miscible oils were tried, but without saving the trees. Following this, sulphur sprays in different concentrations were tested with similar results. Later, DDT in different strengths, alone and in combination with oil and sulphur, was found ineffective. Both oil and parathion were effective in killing the scales, but the affected trees continued to die without showing even temporary recovery. From the observations of those closely connected with the work, it appears that the initial attack set in motion a series of reactions within the infested cedars which gradually reduced their vitality and finally brought about death.

Since treatment of the infested cedars with commonly-used insecticides was found to be relatively useless, consideration was given to calling in outside help. At the request of the Department of Agriculture, two American entomologists visited the Island during 1946 in the role of consultants but were unable to offer any solution to the problem. One great handicap to the free use of insecticides was the fact that most residents of Bermuda rely on water drained from the roofs for drinking and other purposes. This made dusting or spraying with insect poisons an extremely hazardous practice, virtually to the point of ruling it out. It was then that it was decided that the possibility of controlling the scale insects by means of natural enemies, parasites and predators, should be explored.

Accordingly, in December of that year, Dr. J. M. Waterston, plant pathologist in the Bermuda Department of Agriculture, made a special trip to Belleville, Ontario, to discuss the whole question of natural control with Dr. W. R. Thompson, director of the Commonwealth Institute of Biological Control. Realizing that, under the circumstances, the chief hope of solving the problem lay in the field of natural control, Dr. Thompson offered full co-operation and support.

As a result of this visit, Dr. Thompson, accompanied by his wife as technical assistant, came to Ber-

muda in January 1947 to organize a full-scale study of the scale problem from the angle of biological control. A temporary laboratory was opened up in Hamilton and Dr. and Mrs. Thompson settled down for three months of intensive research, a study which was to be continued for a number of years by his Bureau.

Juniper Scale Increases

AT the outset of this study, the Oyster Shell Scale was looked upon as a more serious pest than the new Juniper Scale, due chiefly to the fact that it was not being attacked to any great extent by natural enemies, while the latter insect was being destroyed in large numbers by a small Braconid parasite, *Aspidiotiphagus lounsburyi*, Berlesi and Paoli, thought to have been introduced with it when this scale came in from California on imported nursery stock. However, during 1947 and 1948, the position of these scales, insofar as relative importance is concerned, was reversed; the Juniper Scale taking over the major role until finally, with the passage of time, the Oyster Shell Scale dropped almost completely out of the picture. This cannot be fully explained but is thought to have been caused by a change in the parasite complex.

As a first step in Dr. Thompson's work in Bermuda, a thorough and exhaustive study was made of the natural enemies present of both the Juniper Scale and the Oyster Shell Scale. Only one parasite of any real importance was found, namely, the Braconid mentioned above which at that time was devoting most of its attention to the Juniper Scale. Virtually no predators were encountered and one very interesting point revealed was that ladybird beetles were practically non-existant.

Dr. Thompson quickly set the wheels in motion to have this deficiency rectified. Officers in his Bureau were contacted and arrangements made to have likely predators, more particularly ladybird beetles which showed any tendency to attack scale insects, shipped in from different parts of the world. These were received from such remote points as Africa, Trinidad, California, Australia, Portugal, China, and many other countries. Hundreds of thousands of these beetles were introduced in the next year or two. Most of these were liberated at strategic points across the Island but many specimens of each species were retained for laboratory study and mass-rearing.

Production Increased

AN ingenious method was utilized in the laboratory rearing work which greatly speeded up production and saved many man-hours of labor. It was found that many of these imported beetles would feed on the Oleander Scale, an insect indigenous to Bermuda. Furthermore, a method had previously been worked out for rearing these scales on potato tubers in the laboratory. Advantage was taken of these two important scientific discoveries. Specimens of the Oleander Scale were brought in from the field and after considerable experimentation a pure culture was started on potato tubers. The infested potatoes were placed in shallow flats and covered top and bottom with easily removable factory cotton sheets. A given number of the different beetles were introduced into the flats and allowed to breed and develop for a set period of time at constant temperature and relative humidity. In this way, an original population of, say, 100 beetles could be increased to as many as 5,000 in a period of five to six weeks. This method was utilized over a period of several years in connection with a large number of introduced beetles and made possible the liberation of vast numbers of predators in a relatively short time.

Not all of these beetles became established, although a fairly large percentage did. Most of the ladybirds, in both the adult and larval stages, fed on the scale insects. The most successful species introduced, *Lindorus lophanthae* Blaisd., a dark brown ladybird came from Australia via California. It quickly became established in Bermuda and eventually spread to all parts of the Island. It was mass reared in the laboratory and liberated in thousands during a period of four or five years. Several other species, also, became established but in smaller numbers and in more restricted areas.

This called for increased staff and expanded facilities. In 1949, a modern and well-equipped laboratory was constructed, primarily for this work, at the Agricultural Station in Paget Parish. It contained office and laboratory space adequate for the carrying on of research and rearing work and was fitted up with temperature and humidity controls.

Predators Fail

IN spite of all this effort on the part of Dr. Thompson and his staff, the Juniper Scale continued to increase and spread. By the end of 1947 it could be found in injurious numbers all through the eastern part of the Island and west as far as Warwick Long Bay. In other words, two thirds of Bermuda was infested. Many trees had been killed and severe deterioration was noticeable in most areas. By 1948, the scale had been distributed into every part of Bermuda and the plant pathologist in his report for that year intimated that virtually every cedar tree in the Colony showed the presence of some scale. Many thousands of trees were dead.

The situation was greatly aggravated in 1948 by the occurrence of two hurricanes which swept over the Island in September and October. The first of these was particularly injurious to the cedars since it was for the most part unaccompanied by rain. This meant that the salt spray from the sea dried on the cedars and remained there even after the sun came out. This caused much burning of the cedar foliage. Furthermore, although it appeared to have little adverse effect on scale development, it dislodged and killed many of the insect predators some of which had only recently become established. The October hurricane although not so drastic in its action, also caused some injury to the cedars and undoubtedly affected the predators adversely. These two storms are thought to have set back very seriously the work of

(*Turn to Page 113*)

Results of Field Tests on Use of Ryania Insecticides in

Corn Borer Control

by

Donald F. Starr and John T. Schulz[1]
S. B. Penick & Co.

and Paul Ferguson[1]
Fairmont Canning Co.

Part 1

FOLLOWING publication by Reed and Filmer[2] of information describing the synergistic action of 0.5% n-propyl isome in combination with 15% ryania, full scale field tests were arranged cooperatively by the Fairmont Canning Co. and S. B. Penick & Co. for the summers of 1950 and 1951. Reed and Filmer had reported that 0.5% n-propyl isome with 15% ryania had given control of the European corn borer approximately equal to that obtained with the standard 40% ryania treatment.

The insecticide applications were made with commercial equipment simulating actual field operation, in the vicinity of Fairmont, Minnesota. Fields of sweet corn (Northrup-King Hybrid 407), 50 to 80 acres in size, were selected for the experiments. Low-gallonage sprays, 35 gallons per acre, were applied using a high-clearance sprayer; dusts were applied with both airplane and ground dusters.

Experimental plots were 8 rows wide, about an acre in size for spray and ground dust treatments. For airplane dusting, strips 80 feet wide containing about 3 acres were used with 53 feet in between plots to minimize the effect of drift from one plot to another. A protective strip of 27 feet was established between the plots treated with the power duster on the ground. All the protective strips in the dust experiment were sprayed in order to avoid the loss of corn. No protective strips were considered necessary in the spray experiment since there was only a slight drift of insecticide to the first adjoining row, and all insect counts were made in the center 4 rows.

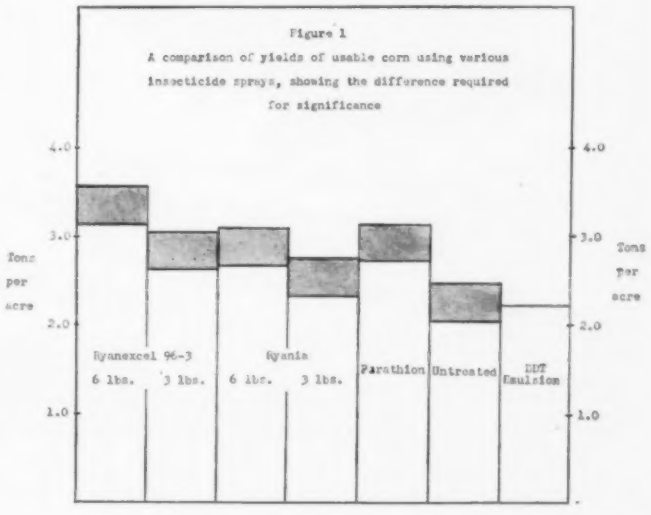
Each spray treatment was repeated four times in a complete randomized block design. The dust experiment consisted of only two randomized blocks instead of four because the size of the airplane plots made it difficult to find an experimental field of sufficient size.

Both 1950 and 1951 were years of light infestation by the European corn borer in the mid-west area, but by inspecting several fields it was possible to select locations of moderate infestation both years. There was not sufficient infestation by the second generation borers in either year to run an experiment, so that all the results reported here refer to first generation corn borers.

DDT and parathion dusts and sprays were included as a basis for comparison. In 1951, 2% EPN dust and sulfoxide combinations with ryania in sprays and dusts were added to the experiments.

Figure 1

A comparison of yields of usable corn using various insecticide sprays, showing the difference required for significance



1—Mr. Ferguson was employed during the project by both S. B. Penick and Company and the Fairmont Canning Company. Mr. Schulz was employed on a temporary basis by S. B. Penick and Company.

2—Reed, John P. and Robert S. Filmer, 1950. Activation of Ryania Dusts by Piperonyl Cyclonene and n-Propyl Isome. Jour. Econ. Ent. 43: (2) :161.

(The authors wish to acknowledge the advice and cooperation of H. E. Blesi and D. R. Montgomery of the Fairmont Canning Co.)

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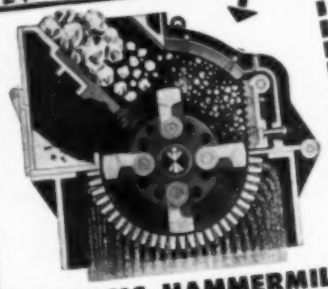

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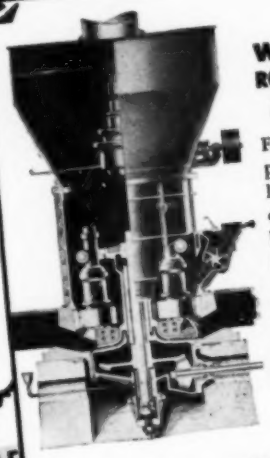

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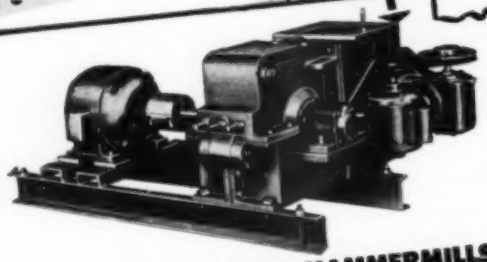

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Insecticides Tested

A TABULATED list is shown below, indicating active ingredients statements. Only the ryania insecticides were supplied by S. B. Penick and Company. All others were purchased by Fairmont Canning Company from midwestern suppliers.

Low Gallonage Sprays

SEVERAL spray operators have found difficulty using ryania in low-gallonage sprays. The original investigators[7] reported the application of 175 gallons of spray containing 7 lbs. of ryania per acre. Four applications, made at 5-day intervals, gave 84 and 92 percent control of the borer population along with 97 and 100 percent saleable ears during the first and second generation of 1944. Attempts to apply 6 lbs. ryania in 35 gals. of water per acre in the tests in 1950 gave too much trouble with clogged nozzles to be practical. By diluting so that 6 lbs. of ryania were applied to an acre in 50 gals. of spray, the spraying was completed with an average of one clogged nozzle for two acres sprayed.

In 1951 there was very little difficulty with clogged nozzles and all the applications were made using 35 gals. of spray per acre. A Kromer high clearance sprayer was used. It was equipped with a boom to spray 8 rows at a time. Three Kromer No. 60 nozzles, giving a flat spray were used per row. The sprayer was operated at a speed of 2.7 miles per hour with a pressure of 40 pounds per square inch on the spray pump.

No outside wetting agent was needed with any of the insecticides, but in 1950 0.3 lb. of a neutral alkylarylsulfonate was added for 6 lbs. of ryania in the spray tank.

(The authors are indebted to Mr. J. D. Barnard and Mr. B. L. Yahnke of the Green Giant Company of Le Sueur, Minnesota for their suggestions regarding their practical experience with ryania in low-gallonage spray application.) Using three or four Spray Engineering

7—Pepper, B. P. and L. A. Carruth, 1945. A New plant Insecticide for Control of the European Corn Borer. Jour. Econ. Ent. 38:(1): 59-66.

Sprays

Insecticide	Active Ingredients	
Ryanicide 100	ryania	100%
Ryanexcel 96-3	ryania	95.8%
	n-propyl isome[3]	3.2%
Ryanexcel 93-6	ryania	92.7%
	n-propyl isome	6.3%
Ryanexcel 90-9	ryania	90.0%
	n-propyl isome	9.0%
Ryania Sulfoxide 96-3	ryania	95.8%
	sulfoxide[4]	3.2%
Ryania Sulfoxide 90-9	ryania	90.0%
	sulfoxide	9.0%
Parathion Wettable Powder, 15%	O,O-diethyl-O-p-nitrophenyl thiophosphate	15.0%
DDT-25%, Emulsifiable	DDT (min. setting point 89°)	25.0%[5]
	Aromatic Petroleum Solv.	70.0%
	Contains 2 lbs. DDT per gallon	

3—n-propyl isome is di-n-propyl malenate-isosafrole condensate, described in "Contributions Boyce Thompson Institute" 14 (2): 79-90 Oct-Dec 1945, and Patent No. 2,431,845.

4—sulfoxide is the n-octyl sulfoxide of isosafrole described in "Contributions Boyce Thompson Institute" 15 (1): 35-45, Oct-Dec 1947, and Patent No. 2,486,445.

5—The same lot of DDT was used through both years experiments. Inspection in 1951, after storage for one year indicated that some of the material may have deteriorated. Samples of the material used in the 1951 experiment were sent out for assay. The results were as follows:

	Chemical Assay Bioassay	(A.O.A.C.)
An independent laboratory	20.3%	—
S. B. Penick Laboratory	21.9%	14 — 24%

Dusts

Insecticide	Active Ingredients	
Ryanicide 40	ryania	40%
Ryanexcel 15-0.5	ryania	15.0%
	n-propyl isome	0.5%
Ryanexcel 7.5-0.5	ryania	7.5%
	n-propyl isome	0.5%
Ryania Sulfoxide 15-0.5	ryania	15.0%
	sulfoxide	0.5%
Ryania Sulfoxide 7.5-0.5	ryania	7.5%
	sulfoxide	0.5%
Parathion, 2%	O,O-diethyl-O-p-nitrophenyl thiophosphate	2.0%
EPN, 2%	O-Ethyl-O-p-nitrophenyl benzene thiophosphonate	2.0%
DDT, 5%	DDT	5.0%[6]

6—Both chemical and bioassays were run on the DDT dust which was used in the 1951 test. The results were as follows:

	Chemical Assay (A.O.A.C.)	Bioassay
S. B. Penick Laboratory	4.8%	2.6 — 4.4%

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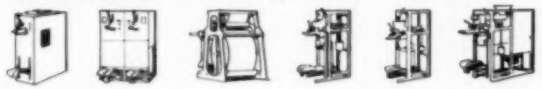


Corporation nozzles T 53063 per row, it is practical to use 6 lbs. of ryania in 25 gals. of spray per acre. Commercial sprayers cover 10 rows at a time at a speed of 5.9 miles per hour, averaging 10 or 11 acres per hour including turns, refills and an occasional stop for a clogged nozzle. There are other nozzles of approximately the same design which are suitable for spraying ryania. They are manufactured by Spraying Systems and the Delawan Company.

Dusting Equipment

A STEARMAN biplane was used to make the airplane dust applications. About 12 rows were covered with each pass of the airplane so that the 24 row plots received 2 passes each. Sixteen guard rows between the airplane plots seemed consistent with the available space and minimum interference from drift.

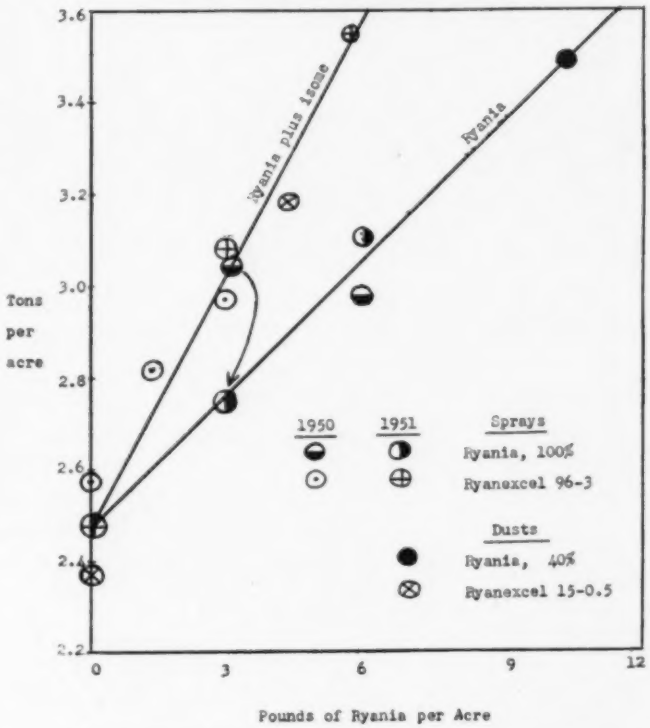
The ground dust applications were made with a Niagara duster mounted on a Kromer high-clearance sprayer. There were two dust nozzles per row and 8 rows were dusted at a time. There were 8 guard rows in between ground dusted plots.

Timing of Applications

IN 1950 the insecticide applications were started one week after the moth flight started and there were 100 to 250 egg masses per 100 plants. Three applications were made 8 days apart.

Figure 2

The Effect of Various Amounts of Ryania Insecticides on the Yield of Usable Corn



In 1951, only two applications were made 5 and 6 days apart, and they were started late. At the time of the first application nearly all eggs had hatched and there were 200 to 300 borers per 100 plants and the moths had been flying for 3 weeks.

(*Turn to Page* 117)

Summary Calender Comparing Sweetcorn and Corn Borer Conditions for the Two Seasons

	1950		1951	
	Dust Experiment	Spray Experiment	Dust Experiment	Spray Experiment
May 7	Planting	—	—	—
May 11	Planting	Planting	—	Planting
May 12	—	Planting	—	Planting
May 13	—	—	Planting	Planting
May 16	—	—	Planting	—
June 21	9 moths in light trap		—	—
June 22	637 mean degree-days over 50°F.		540 mean degree-days over 50°F.	
June 23	1046 moths in light trap		—	—
June 25	—	—	11 moths in light trap	
June 26	690 mean degree-days over 50°F. 260 egg masses per 100 plants	—	610 mean degree-days over 50°F. —	—
June 27	—	—	240 moths in light trap	

(*Summary Continued on Next Page*)

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Red spider mite

Cranberries:
Lecanium scale crawler

Currants and gooseberries:
Aphids
Red spider mite

Raspberries:
Aphids
Red spider mite

CABBAGE, MUSTARD, TURNIP, KALE, RADISH AND CARROT
Vegetable weevil

CHERRY
Casebearer
Fruit fly
Leaf miner
Pandemis moth
Red spider mite
San Jose scale crawler
Shot-hole borer

CITRUS
Aphids

CORN
Budworm
Corn earworm
Leaf aphid
Fall armyworm
Sap beetle

CUCUMBER, SQUASH AND MELONS
Stink bug
Vine borer

GRAPES
Grape berry moth

LETTUCE
Aphids
Leafhopper

ORNAMENTALS (outdoors)
Bagworm
Cottony-cushion scale
Juniper webworm
Lace bug
Lecanium scale
Thrips

PEACH
Lecanium scale
Red-banded leaf roller
Shot-hole borer

PEAS
Pea weevil

PECAN
Black pecan aphid
Nut casebearer
Red spider mite
Twig girdler
Walnut defoliator
Webworm
Yellow aphid

PINEAPPLE (before planting)
Mealybug

PINEAPPLE (treatment of beds)
Mealybug
Cricket

POTATO
Armyworm

PRUNE AND PLUM
San Jose scale crawler

SOYBEAN
Velvetbean caterpillar

TOBACCO (seedbed)
Flea beetle
Midge larvae
Vegetable weevil

TOBACCO (field)
Flea beetle
Hornworm
Vegetable weevil

TOMATO
Armyworm

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June 29	Height, 32 inches	Height, 27 inches	—	—
	—	108 egg masses per 100 plants	—	—
	—	First spray	—	—
June 30	First airplane dust	First spray	25 egg masses per 100 plants	45 egg masses per 100 plants
July 1	First airplane dust	—	—	—
July 2	First airplane dust	—	60 egg masses per 100 plants	85 egg masses per 100 plants
	First ground dust	—	—	—
July 6	Height, 41 inches	Height, 36 inches	—	—
	140 egg masses per 100 plants	124 egg masses per 100 plants	—	—
July 7	—	Second spray	—	—
July 8	—	Second spray	—	—
July 11	Second airplane dust	—	—	110 egg masses per 100 plants
July 13	Second ground dust	—	85 egg masses per 100 plants	—
July 15	—	Third spray	—	—
July 16	—	Third spray	—	—
July 17	—	—	—	235 borers per 100 plants
				First spray
July 18	Third airplane dust	Borer Counts made	—	—
July 19	—	Borer Counts made	310 borers per 100 plants	—
			First airplane dust	—
July 20	—	Borer Counts made	—	—
July 21	—	Borer Counts made	—	—
July 22	—	—	First ground dust	—
July 23	—	—	—	Second spray
July 24	Borer Counts made	—	—	Second spray
July 25	Borer Counts made	—	—	—
July 27	—	—	Second ground dust	—
July 31	—	—	—	Borer Counts made
August 1	—	—	—	Borer Counts made
August 7	—	—	Borer Counts made	—
August 9	—	—	Borer Counts made	—
August 16	Harvest	—	—	—
August 18	Harvest	—	—	—
August 20	—	Harvest	—	—
August 21	—	—	—	Harvest
August 22	—	—	Harvest	Harvest
August 23	—	—	Harvest	—

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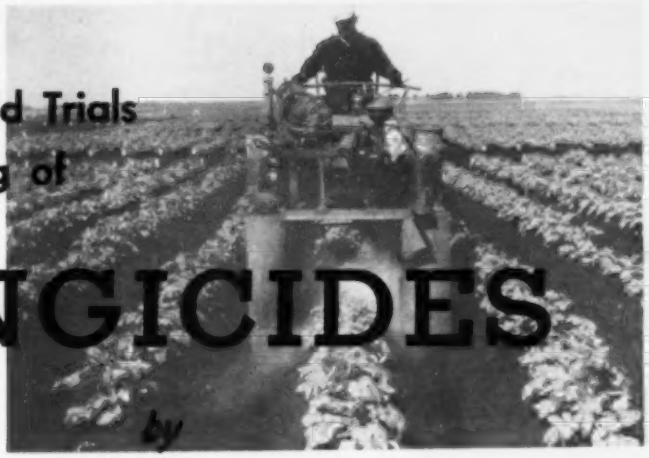

by

G. R. Townsend

Florida Field Tests
Belle Glade, Fla.

THE use of chemicals as protectants against plant diseases began in France about seventy years ago. Millardet observed that there was less grape mildew on vines to which a liquid mixture of copper sulfate and lime had been applied to discourage pilfering. This observation of the value of copper sulfate, although somewhat accidental, ushered in a period of research on chemicals as fungicides which has continued to this day. In fact, the number of compounds under investigation probably never was greater than now.

Today, the development of new fungicides is a planned procedure, and success is not obtained through such an accidental observation as led to the development of Bordeaux mixture. Chemical and biological literature must be searched for suggestions as to the types of chemicals that might have fungicidal value. A promising idea may have to be abandoned because of patent restrictions on the use and development of certain chemicals. When such restrictions have been cleared, the chemists must prepare and formulate the new chemical for laboratory testing. Several procedures are available for determining whether a product has fungicidal value or not. These methods usually involve a determination of the lethal or inhibitory effect of the chemical in liquid formulation on the spores or mycelium of certain plant pathogenic fungi.

When it has been shown that a new product can inhibit the growth of these fungi, the next step is a test involving plants. Various fungicide screening techniques utilize potted plants in the laboratory or greenhouse and give readings on the potency of a product against certain specific diseases. Indications of phytotoxicity, if any, also can be obtained in such tests. To some extent these techniques attempt to provide weathering conditions as in the "artificial rain" tests. A satisfactory result in these tests should lead to field trials rather than product development at this stage.

Table 1.
Percent of late blight of potatoes on variously treated plots in December, 1951

Treatment and Dosage		12/3	12/7	12/10	12/13	12/17
Bordo	8/8/100	None	2.3	18.3	40.0	65.0
Dithane-Zn	2/1/100	None	Trace	3.3	7.3	27.5
Dithane-Zn	1/½/100	Trace	2.3	11.3	20.0	46.2
Parzate	2/100	Trace	Trace	5.0	8.3	35.0
Manzate	2/100	None	Trace	1.8	10.0	26.2
Ortho 406	4/100	None	1.8	8.8	15.0	33.7
Checks	——	2.6	53.8	84.2	97.9	100.0

Table 2.
Yield of potatoes on variously treated plots in December, 1951.

	Treatment 50 lb. sacks per acre.	
Borodo	8/8/100	151
Dithane-Zn	2/1/100	259
Dithane-Zn	1/½/100	226
Parzate	2/100	237
Manzate	2/100	320*
Ortho 406	4/100	245
Checks	——	111 to 153

*Manzate gave a nutritional resonse in addition to disease control.

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of how well the product will work in the field. This can be answered only in field tests which in many instances are made on field plots maintained for this purpose by industry, and by the state and federal agricultural experiment stations. The Ohio Agricultural Experiment Station has performed notable service of this sort for several years.

The Florida Field Trials were established as an independent venture in 1946. These trials provide facilities for field testing new fungicides and other agricultural chemicals at a season of the year when field testing cannot be done in other parts of the country. They are particularly advantageous to the chemical industry because an extra testing season can be gained each year. Research and development projects can be hastened considerably in this way.

The Florida Field Trials are located near Belle Glade, Fla., in the Lake Okeechobee region. In this area, vegetable crops are grown from September to June. Two plantings of some crops are possible. The plant diseases found here are generally the same as those found on the same crops in the North during the summer. Disease development, however, often is more intense than it is in the North, making the area particularly suitable for fungicide testing. The late blight of potatoes and tomatoes, early blight of celery, cucurbit mildew, and *Helminthosporium* blight of sweet corn are used for testing foliar fungicides. The incidence of these diseases normally is sufficient to provide good tests. Chemicals intended for seed or soil treatments can be tested against a complex of soil inhabiting fungi that usually cause seed decay or damping-off diseases in peas, beets, cucumbers, spinach, lima beans, cotton and peanuts.

More than one hundred products and formulations were tested on potatoes in the Florida Field Trials in the fall of 1951. While the results with new products cannot be disclosed, it is permissible to report on the effectiveness of those fungicides that were used as standards in the trials. The very satisfactory performance of some of these materials sets a high standard against which the new products can be evaluated.

Table 3.
Final stands per 100 seeds as averages from five plots.

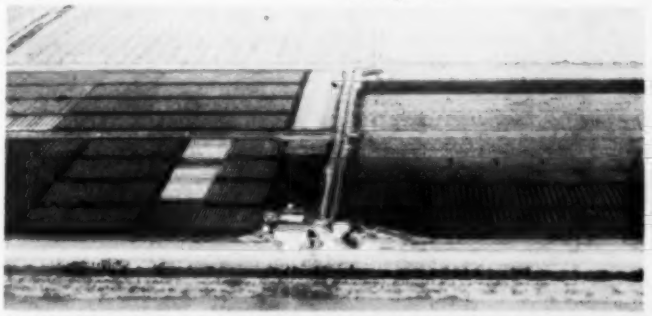
Treatment	Peanuts Dosage A	Peanuts Dosage B	Cucumbers
None	79.0	——	28.4
A	93.4	89.2	78.8
B	97.2	95.2	86.8
C	73.4	89.8	86.2
D	84.4	97.0	77.6
E	91.8	94.8	71.0
F	94.0	97.2	85.4
H	96.2	95.6	77.4

In the series of tests from which the data in Table 1 were obtained, the fungicides were applied at 160 gallons per acre under a pressure of 300 pounds p.s.i. Four "Spraying Systems T O-4-25" nozzles were used on a single row self-propelled sprayer. Applications of the fungicides were made weekly for seven weeks until December 11, 1951. Late blight *(Phytopthora infestans)* was the only disease affecting the potatoes. It was noted first about November 26. During the first two weeks of December, it developed very rapidly on the check plots and on

(*Turn to Page 135*)

Photos Below:
Aerial view of Florida Field Trials near Belle Glade. Many chemical compounds are tested for fungitoxicity and insecticidal properties in year-round studies.

(Lower photo) Results of using chemical treatment to control late blight of potato. Rows to right and left are almost completely destroyed, while treated row in center appears to be healthy and vigorous.



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Start your summer spray program with Black Leaf 253 and continue to use it throughout the season, as often and as long as necessary. Each application should be thorough, especially if red-banded leafroller or similar pests are a problem.

Use 2½ pounds in 100 gallons of water and repeat at the cover spray intervals recommended by local authorities. Use 2 pounds, if the interval between sprays is shorter than usual or if infestation is unusually low. Use 3 pounds, if the interval between sprays is longer than usual, or if infestation is severe.

Make such specially-timed, supplemental applications as may be recommended in your area to control apple maggot, curculio, or red-banded leafroller.

Do not use Black Leaf 253 within 30 days of harvest. When sprays must be applied to protect early varieties just before or during harvest, use 2 to 3 pounds of Black Leaf 155 *(fixed nicotine)* which leaves no undesirable chemical residue.

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The Listening Post

Chemical Control of Damping-Off & Root Rot

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

Late Blight Appears

LATE blight of tomatoes *(Phytophthora infestans)* has been reported in Florida so far this year from the Vero Beach, Fort Pierce, Indiantown, West Palm Beach, Belle Glade, Homestead, and Bradenton areas. Potato late blight was found in the Hastings, Florida, area where most growers employed nabam-zinc sulfate spray to control. Potato blight was also reported for the first time since the fall of 1950 in Louisiana and this occurrence constitutes the earliest record of late blight on spring potatoes in Louisiana.

Blue Mold of Tobacco: Blue mold of tobacco *(Peronospora tabacina)* was again present this year at an early date and later became widely scattered throughout the flue-cured area of Georgia. Other areas affected in the first three months of this year included the shade tobacco area in Gadsden County, Florida, and the eastern counties of the tobacco belt of North and South Carolina.

The early appearance of the disease can be attributed to the early seeding in December, followed by favorable weather conditions for the growth of the plants in December. This was followed by a warm January with cloudy and foggy days favoring the sporulation and spread of the disease. These above-normal January temperatures and extended cloudy weather conditions favored infection of the plants with primary inoculum and the rapid build-up and spread of secondary infection.

The earliness of attack, coupled with severe early damage to some beds, could well have proved very destructive except for the excellent job of spraying and dusting done by the growers. The early attack also caused more growers than heretofore to use blue mold fungicides and to sustain their treatments against a possible epidemic of the disease. Growers successful in controlling the disease used 15% "Fermate" dust, probably applying in the neighborhood of thirty pounds of dust to the 100 square yards. Severe damage occurred in untreated beds. In the more northerly section of the tobacco-growing area, growers dusted or sprayed to prevent an outbreak and by the end of March, plants were generally large enough to withstand attack.

Cause and Control of Damping-Off and Root-Rot in Conifer Seedbeds

R. S. COX, of the Delaware Agricultural Experiment Station states that in November, 1949 the conifer seedbeds of the State Forest Tree Nursery, Lincoln, Delaware, were found to be in a seriously diseased condition. The local name of the disease, "three-year root rot," was derived primarily from symptom-expression on three-year-old white pine *(Pinus strobus)* seedlings, although seedlings of Norway spruce *(Picea abies)*, and Douglas fir *(Pseudotsuga*

Table 1

Results of isolations from stems and roots of conifer seedlings from State Forestry Nursery, Lincoln, Delaware.[a]

Host Plant	Age of Seedlings (Years)	Number of Pieces Planted	Fungi isolated[b]					
			Rhizoctonia	Fusarium	Trichoderma	Phoma	Botrytis	Sterile Form
White pine	½ or less	262	83	52	30	1	2	6
	1	55	5	14	0	0	10	0
	2	74	14	32	46	0	15	1
	3	338	40	191	61	0	10	0
Total		729	142	289	137	1	37	7
Norway spruce	½ or less	392	217	39	8	76	5	40
	2	62	19	25	1	0	10	1
Total		454	236	64	9	76	15	41
Douglas fir	½ or less	132	17	43	15	0	16	8
Grand Total		1315	395	396	161	77	68	56

[a]Four isolation techniques were used: (1) diseased pieces dipped in 20% Clorox for 3 minutes and plated directly; (2) dipped in bichloride of mercury (1-1000) ½ minute, washed in 3 changes of sterile distilled water and plated; (3) washed in 3 changes of sterile distilled water and plated; and, (4) washed in sterile water and planted in apples from which the cores approximately ½ inch depth had been removed by means of a flamed corkborer 2 mm. in diameter.
[b]Number of isolates of each organism from specified seedlings.

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Table 2

Total emergence and percent post-emergence damping-off of conifer seedlings 50 days after seeding in steamed soil artificially inoculated with various fungus isolates in the greenhouse

Isolates[a]	Experimental Host Plants							
	Norway spruce		White pine		Loblolly pine		Douglas fir	
	Total[b] Emergence No.	Post-emergence damping-off %	Total Emergence No.	Post-emergence damping-off %	Total Emergence No.	Post-emergence damping-off %	Total Emergence No.	Post-emergence damping-off %
Check	247	1	122	0	258	1	44	38
R-1	79	62	68	22	231	11	40	50
R-2	50	52	49	37	203	33	55	58
R-3	85	51	81	35	215	27	14	43
Sterile Form	223	17	93	2	193	16	50	48
Phoma	243	7	125	1	247	3	30	27
Fusarium	244	3	104	0	216	0	18	72
Botrytis	188	8	114	2	220	1	38	6

[a]The fungus isolates are identified as follows:
R-1, *Rhizoctonia solani* isolated from Douglas fir rootlets
R-2, *Rhizoctonia solani* isolated from Norway spruce rootlets
R-3, *Rhizoctonia solani* isolated from white pine stems
Sterile Form, sterile form isolated from Norway spruce rootlets
Phoma isolated from Norway spruce rootlets
Fusarium isolated from white pine rootlets
Botrytis isolated from white pine rootlets
[b]From a total of 400 seed planted.

taxifolia caesia) were also affected. On three-year-old white pine, the disease is characterized by severe browning and casting of the needles. Symptoms are first evidenced in August by a browning of the needle tips, followed rapidly by a necrotic condition extending the entire length of the needles. The transformation from green, apparently-healthy needles to severe defoliation has been known to take place within a two-week period.

Examinations revealed that the disease was not restricted to three-year-old seedlings, but that seedlings of all three species were susceptible during all stages of growth in the seedbed up to three years. Loblolly pine (*Pinus taeda*) appeared not to be greatly affected.

A high degree of mortality occured among seedlings of the three susceptible species throughout the first year and, to a lesser extent, during the second and third years. Frequently, this was followed by needle-cast and death of white-pine seedlings in fall of the third year.

Several fungi are known to be capable of causing "damping-off," "late damping-off," and "root-rot" of conifer seedlings. Also, nematodes are suspected to be an important factor in a pine root-rot in the South. However, it did not seem that the action of damping off fungi and/or nematodes could account adequately for the sudden browning and shedding of needles of white-pine seedlings in autumn of the third year; neither did the so-called "needle-cast" fungi appear to be of a major consideration, since fruiting bodies of these organisms were not found. Since Lincoln, Delaware, is situated on the southern fringe of the Coastal Plains white-pine range, and since the State Forestry Nursery is located on very sandy soil, the prolonged action of fluctuating temperatures and rainfall in winter and summer, perhaps aggravated by a limited root system due to root rot, appeared to be a possible contributory factor to the three-year phase of the disease. Conifer seedlings are known to be susceptible to excessive drought and extreme temperatures.

A preliminary report on the results of isolations from stems and roots of variously-aged seedlings of white pine, Norway spruce, and Douglas fir, and subsequent greenhouse pathogenicity studies with isolated organisms on the effect of several soil fumigants on stand-and disease-development, and on the effect

Table 3

Effect of various soil fumigants on subsequent stand and height of conifer seedlings approximately one year after seeding.[a]

Treatment[b]	Rate of application gals./acre	White pine		Norway spruce	
		Stand[c]	Height[d] (mm)	Stand[c]	Height[d] (mm)
Check	—	34	87	26	76
Chloropicrin	40	125	185	58	145
Formaldehyde (40%)	435	101	128	43	136
Dichloropropene mixture	28	48	82	20	103
	57	47	101	43	114
Ethylene dibromide	28	27	80	26	103
	57	54	95	26	110
L.S.D. .05		22		N.S.	

[a]Notes relative to soil treatments: soil treated April 5, 1950. Chloropicrin confined with water seal. Formaldehyde applied as a drench (1-50) at rates of ½ gal./sq. ft. and confined with roofing paper for 5 days. Remaining materials (including chloropicrin) applied with hand injector. Soil temperature at time of fumigation 55°F.
[b]The following materials were furnished by the manufacturers: Chloropicrin (Larvacide) and ethylene dibromide (Iscobrome D) by Innis-Speiden Company; Formaldehyde by E. I. duPont deNemours & Co.; dichloropropane-dichloropropene mixtures (D-D) by Shell Chemical Company.
[c]Average of 2 samples taken from a sq. ft. area in each plot.
[d]Average of 10 seedlings.

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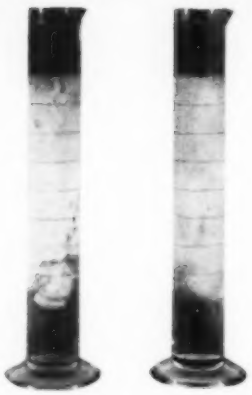

Photograph above shows impartial tests using BHC-DDT concentrate. REMSEN EMULSIFIER 202, at left, dispersed instantaneously. The same percentage of commercial emulsifier, at right, gave poor dispersion with large droplets settling to the bottom. After ten minutes, without agitation, the emulsion using REMSEN EMULSIFIER 202 remained completely stable, while most of the concentrate in the comparative test had settled to the bottom.

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of laths as partial shade, follows.

Cause: Isolation data are summarized in Table 1. Several fungi were consistently isolated in culture from diseased stems and roots. One form closely fitted the description of *Rhizoctonia solani* and is so referred to. Other forms were tentatively considered as species of *Fusarium, Phoma, Botrytis,* and *Trichoderma*. Still another form, as yet unclassified, resembled *R. solani* in some respects but not all. *Trichoderma* predominated in cultures where surface-sterilizing agents were not employed. Since this fungus is generally considered as a common soil-saprophyte, it was not included in pathogenicity studies.

It is interesting to note that, except from Douglas fir,*Rhizoctonia* was isolated more frequently than other fungi from seedlings six months old or less, whereas on older seedlings (isolations primarily from rootlet lesions) *Fusarium* predominated.

Greenhouse pathogenicity tests were undertaken to determine, if possible, the relative importance of these organisms in respect to pre- and post-emergence damping-off and to root rot.

In one test, using seven one-week-old fungous isolates for inoculum, 128 pots containing steamed soil were divided into four equal lots of 32 pots each. Each lot of pots was planted (100 seed per pot) to one of the four species: White pine, Norway spruce, Douglas fir, and loblolly pine. Four pots of each lot of 32 were inoculated with one of the seven fungous isolates, leaving four pots of each lot untreated to serve as checks. The fungous cultures, cut up into approximately one-quarter inch squares, were placed directly over the uncovered seed. The seed and inoculum were then covered with a layer of steamed soil approximately one-quarter inch in thickness. The test ran from February 23 to April 17, 1951. Starting on March 9, stand counts were made three times weekly. Dead seedlings were recorded and discarded each time a count was made. At the end of the test, roots were examined for root-rot symptoms. Results on stand and post-emergence damping-off are recorded in Table 2.

These data leave many questions unanswered, but the following points of interest are noted:

(a) All three isolates of *Rhizoctonia* presumably caused pre-emergence damping-off of Norway spruce and white pine, since total emergence (healthy plus dead seedlings) was considerably less than that of the checks.

(b) All *Rhizoctonia* isolates caused post-emergence damping-off of Norway spruce, white pine, loblolly pine, and probably Douglas fir. The fungus was re-obtained in culture from a high percentage of the inocu-

(*Turn to Page* 137)

Screw-worms Overwinter Farther North in '52

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is connected with the department of Insect Pest Survey and Information, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.

By Kelvin Dorward

IN surveys conducted by the Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, during the winter of 1951-52, it was found that screw-worm flies survived the winter in regions considerably north of the usual overwintering area. The case rate in this area, however, was very low.

In the southeastern part of the United States, screw-worm populations were the lightest and the infested area the smallest during 1951 of any year since surveys have been made (1943-51) in that region. The overwintering area in the season of 1950-51 was at least 90 miles farther south than any previous winter due to abnormally low temperatures. This area was determined to be south of a line extending from near Tampa on the west coast of Florida to Cocoa on the east coast. The fly population in this area was extremely low. Following this an unusually late spring resulted in a slow build-up in fly populations. The mild 1951-52 winter permitted screw-worms to survive over practically all of the territory involved in 1951 but case incidence was very low.

In Texas, severe drouth conditions in the summer of 1951 were unfavorable for screw-worm build-up. The mild winter of 1951-52, however, permitted survival much farther north than usual, but again the case incidence was low.

Adult screw-worm flies survived the winter in three southern California counties: Imperial, San Diego, and Riverside. The infestations in these counties were confined to the irrigated valleys which are considered normal overwintering areas. Overwintering of screw-worm flies was observed along the Colorado river and in irrigated valleys in Yuma County, Arizona. This is considered a normal overwintering area. There was no evidence of screw-worm overwintering in New Mexico.

The accompanying map shows the limit of screwworm migration during 1951, the normal overwintering areas and the 1951-52 overwintering areas.

Boll Weevil Near Normal

DRY weather conditions during 1951 were largely responsible for the small number of boll weevils that went into hibernation throughout most of the weevil area of the cotton belt. In many of the cotton states, the number of weevils hibernating during the winter of 1951-52 was the lowest, or near the lowest, since survey records have been main-

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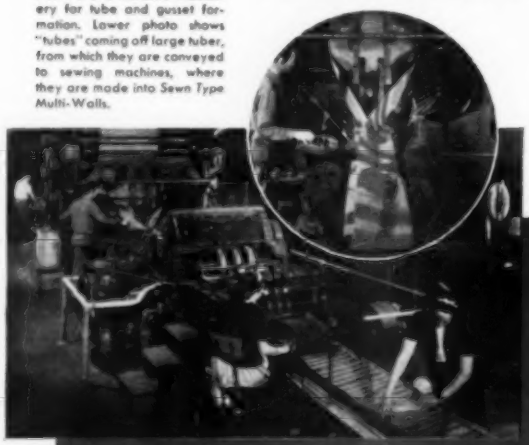

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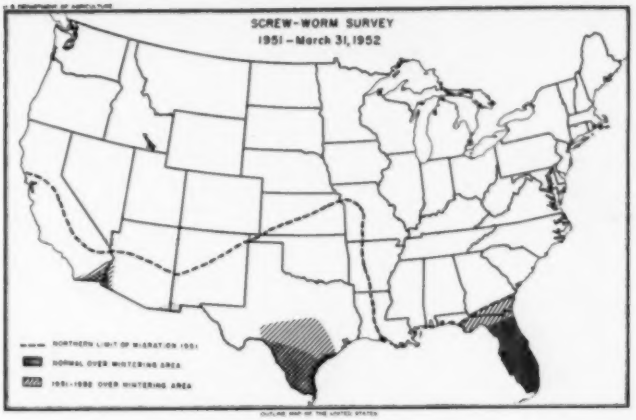

tained. The mild winter just experienced, however, has permitted a high percentage of the hibernating weevils to survive, resulting in a near normal population for the beginning of the 1952 crop year.

Vegetable Insects

THE Mexican bean beetle was first observed during late March on young beans in southern Georgia and northwestern Florida and in South Carolina during early April. Control measures were applied in a few northwest Florida fields. The pea aphid was present in moderate numbers in most South Carolina plantings. A light to moderate infestation of the pea aphid was present on 2,000 acres of peas in Ventura County, California. Damage to cabbage, attributed to onion thrips, was common in Orange County, California. A heavy infestation of the cabbage webworm was reported on some cabbage in the Ft. Pierce, Florida area.

The Colorado potato beetle was on the increase in southern Georgia and required control on some potato and tomato plantings. The green peach aphid was reported to be light but general in the flue cured tobacco plant beds southwest of Ware County, Georgia. No aphid infestations were observed on shade tobacco plant beds or newly-set shade tobacco in northwest Florida, possibly due to insecticide applications. In Columbia County, Florida, aphids were found on five percent of the flue-cured tobacco plant beds.

Migrations of the beet leafhopper to fields of cantaloups in the Salt River Valley of Arizona commenced April 4. Fields containing small weeds had higher leaf hopper populations than did weed-free fields. Most of the cantaloups were in the cotyledon stage which is most susceptible to curly top. The beet leafhopper spring movement from the southern desert breeding areas to the cultivated districts of Utah, western Colorado and southern Nevada is expected to be large this year.

Fruit Insects

IN the Vincennes, Indiana, area the number of sucking insects bumped from peach trees April 3 decreased from the number bumped March 27, due primarily to less favorable weather for activity and the application of protective measures. In Lawrence and Orange Counties, Indiana, less than 20% of the trees jarred showed no tarnished plant bugs, with bugs ranging from none to 20 per tree. A heavy population of plant bugs is predicted for this area. Redbanded leaf roller adults were first observed in orchards near Vincennes, Indiana, March 20. No egg masses had been located in orchards at that time. The first codling moth pupa was found in the vicinity of Vincennes April 14, 1952. In central and southern New Jersey it was expected that all apple aphid eggs would be hatched by April 2 and in Northern New Jersey by April 19.

The first plum curculio adult was jarred from peach trees in Ft. Valley, Georgia March 13. This was 13 days later than in 1951, but the development of the peach crop is correspondingly late this year. However, well developed eggs were found in some adults examined. This is unusual, since several weeks usually elapse from the time of emergence to the development of eggs.★★

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Pesticide Needs Up in '52

Farmers' estimated requirements for pesticides in the current crop year are about nine per cent above that of 1951, according to a recent announcement by the U. S. Department of Agriculture. It is estimated that about 60 per cent more chlorinated propane derivatives will be used, 30 per cent more toxaphene, 20 per cent more methoxychlor, 30 per cent more EPN, and about 250 per cent more dieldrin.

•

Film on "Cotton Bandits"

Shell Chemical Corp., New York, has prepared an educational film on early and late season control of cotton insects. Letters announcing the film is available for showing have been sent to County Agents. The film consists of two strips with a recorded narration. It was prepared by the agricultural staff of Shell, and is based upon data released by the U. S. Dept. of Agriculture and various state agricultural experimental stations. The film was developed to present farmers with the latest information on cotton insect control.

•

Monsanto Ups Schlattman

R. H. Schlattman will take charge of patent activities for Monsanto Chemical Company's Texas Division at Texas City, Tex., according to a recent announcement. Mr. Schlattman, who joined Monsanto in 1941, has been a member of the company's Organic Chemicals Division patent department since 1948.

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Suppliers' Bulletins

Pennsalt Lindane Bulletin

A new bulletin, "Insect Control on Crops, Shrubs and Trees with Lindane" has just been released by the Agricultural Chemicals Department of Pennsylvania Salt Manufacturing Co., Philadelphia. It lists in chart form the host plant, insects which may be controlled with lindane, as well as recommended concentrations and suggestions for most effective application. Instructions are given for formulations containing 1%, 20% and 25% lindane. Information is also given on seed treatment for wireworm control with a wettable powder containing 25% lindane. Copies available by writing Pennsalt at 1000 Widener Bldg., Phila.

•

Aldrin & Dieldrin Booklets

Julius Hyman & Co., Denver, Colo., have issued three folders describing control of cotton pests and adult alfalfa weevil with aldrin and dieldrin.

Two of the folders, "Control of Cotton Insects with Aldrin" and "Control of Cotton Insects with Dieldrin", include general information on the use of the two insecticides, their specific advantages and correct dosages.

The third folder, "Control of Adult Alfalfa Weevil with Dieldrin," gives instructions for proper application, dosages for spraying and dusting and other points of value for effective weevil control. Copies are available upon request from the company, Denver, Colo.

•

Parathion Handbook Out

American Cyanamid Co., New York, has issued a "Grower's Handbook" giving full information on the use and handling of parathion.

Included in the book's contents are suggested safety precautions, parathion formulations, insects controlled by the material, wettable powders, dusts, and emulsifiable liquids. Throughout the 32-page booklet are instructions for safe usage of parathion, and there are three pages of photographs illustrating proper clothing, protective masks and equipment to be employed in handling the insecticide.

The booklet is available from American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

•

"Penta" Booklet Issued

Detailed answers to questions frequently asked about pentachlorophenol, a chemical to protect wood against decay and insect attack, are contained in a 40-page booklet just issued by Monsanto Chemical Company. The 51 questions answered in the booklet are those which Monsanto representatives have been asked most often. They range from "What is Penta?" to "How do Penta solutions preserve wood?" The booklet is available from Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo.

•

New Catalog Available

The Bin-Dicator Co., Detroit, Michigan, recently published a new 18-page illustrated catalog for 1952, describing the company's products. Bin-Dicator Co. markets bin levels used to indicate the level of granular and pulverized materials stored in tanks, silos, hoppers and bins. The new catalog supplies installation data for the various types of units, including some wiring diagrams.

•

New Acme Auxiliary Valve

Acme Protection Equipment Co., Chicago, recently announced that it has developed a new auxiliary valve to prevent freezing of gas mask valves in sub-zero temperatures. Known as "Protect-A-Valve," the new product provides a secondary valve that fits over the regular exhalation valve. Full details are available in a bulletin from Acme Protection Equipment Co.

Lindane Book Revised

California Spray - Chemical Corp., Richmond, Calif., has issued a revised edition of its 32-page book, "The Story of Lindane." The booklet, printed in two colors, keynotes the importance and potential for lindane's use in all fields of agriculture. It gives a short history of the insecticide, research and technical data on the chemistry of lindane and a brief background of the firm manufacturing the material. According to Calspray, the booklet was prepared especially for distribution to formulators who will be using lindane in their products. The booklet is available upon request.

•

Offers Pesticide Folder

The latest German developments in the field of insecticides, fungicides and weed killers are covered in a series of reports being offered by Research Information Service, 53 Nassau Street, New York. Bulletin 63 entitled "Insecticides" lists a number of processes for manufacturing benzene hexachloride. Section 2 of the bulletin covers a number of new insecticides and fungicides, while section 3 deals with methods of preparation and application of various materials.

A folder describing the reports is available without charge. However, the reports themselves sell at prices ranging from $4.50 to 11.00.

•

Safety Equipment Cleaner

Mine Safety Appliances Co., Pittsburg, has recently introduced a new cleaner and sanitizer specially designed for use in cleaning personal safety equipment, such as respirators, goggles, faceshields, rubber and plastic clothing, etc. Samples of the new cleaner, and a bulletin describing it, are available to readers of AGRICULTURAL CHEMICALS.

•

"Thanite" Booklet Offered

A new 8-page booklet, "Take a Good Look at Thanite," has been published by Hercules Powder Co. It includes tables of comparative testing data on the product as a toxicant

(*Turn to Page 113*)

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Technical Briefs

Seed Treatment Studies

Increased stands of peanuts and soybeans were obtained during seed treatment tests in 1951 using various seed treatment chemicals. The soybean experiments showed that "Spergon" and "Arasan" applied at the rate of two ounces per bushel were the most effective. Stands were increased from 7% to 16% but yield differences were not significant. Summer drought in all cases seriously reduced yields.

Stands with shelled peanuts were increased by 13% to 35% from seed treatment chemicals in tests also conducted during 1951. "Phygon" used as a slurry treatment at the rate of three ounces per 100 pounds of shelled seed was slightly more effective than "Spergon SI" at 6 ounces, or 2% "Ceresan" at three ounces. Plots with treated seed yielded more than those plots with untreated seed. "Phygon" treated seed produced twenty-seven per cent more threshed peanuts than the check.

Concurrent studies of the compatability of chemical seed strains and the legume nodule bacteria showed that when proper strains of legume bacteria had already been presented in the soil seed, treatments had no adverse effect on nodulation. However, when legume inoculum has been added to the treated seed and the soil has not previously inoculated, nodulation has been consistently reduced. Under such conditions, soybeans showed about one-half as many nodules in 1950 and about one-quarter as many nodules in 1951

L. A. Brinkerhoff and Donald Swift — Report before the seventh annual Oklahoma Crops, Soils and Fertilizer Conference.

•

Organics for Smut Control

The Federal Laboratory of Plant Pathology, Winnipeg, recently released the results of a three year survey on the control of smuts on coarse-grain crops. These can be kept practically smut-free if proper methods of treatment are used. The survey showed that older methods are not satisfactory for treating seeds as they may cause injury. Modern organic mercury disinfectants gave much better smut control—the report stated that the most effective chemical used was the organic mercury compound, *Ceresan M*. It also stated that mercury treated grains could be stored for a much longer time than with older types of fungicides.

•

Solution to Resistance?

New light has been shed on the problem of resistance of insect pests to chemicals used to control them, according to two Connecticut scientists, Dr. Raimon L. Beard and Neely Turner, both of The Connecticut Agricultural Experiment Station.

Insect resistance was first noticed when DDT became less and less effective for fly control in some areas. Scientists and farmers met the problem by switching to still newer insecticides, which gave satisfactory control for a while but then, they, too, declined in fly-killing power. The phenomenon has been noted with other insects, the most recent instance being the drop in effectiveness of DDT for lice control in Korea.

Up to now, it has been generally believed that the hardier insects survived the sprays and produced offspring which were, in turn, resistant. After the process had been repeated for several generations, according to the theory, a resistant strain was developed and insecticide efficiency dropped.

Dr. Beard's investigations indicate that insects are not fixed in their resistance to insecticides. That is, an individual insect may be resistant to an insecticide one day and, a few days later, may be killed by it easily.

From this, the only sure means of selecting the truly resistant insects is to expose them constantly to a material for a long time. This treatment would eliminate any individual which was even temporarily susceptible, and would permit survival only of indivividuals which were consistently resistant.

Thus, it would seem simple to avoid build-up of resistance by avoiding use of residual chemicals. Farmers did not have trouble with resistance when they depended wholly on rotenone and nicotine.

Working on the problem from another direction, Mr. Turner found a second way to circumvent the resistance problem. By using a combination of chemicals rather than a single insecticide, the chances of resistance build-up are diminished, since an insect resistant to one chemical is not necessarily resistant to another.

Tests at the Connecticut Station have shown that two weak insecticides give as high a kill of insects as one strong one. Experiments now are aimed at finding good combinations for commercial use against specific insects.

Insecticide Synergists Tested

FIELD-plot tests were made at Charleston, S. C., from 1942 through 1949, of several materials that might increase the effectiveness of pyrethrum and rotenone insecticides against cabbage caterpillars. These insecticides were also tested in impregnated dusts. In addition, comparisons were made of talc, sulfur, pyrophyllite, and kaolin as diluents in pyrethrum and rotenone dusts.

The insecticides were applied with hand dusters or sprayers, usually at dosages of 20 to 30 pounds of dust or about 100 gallons of spray per acre-application. The results were based on numbers of caterpillars, by species, surviving on an average of 25 plants per plot.

The species included were the cabbage looper (*Trichoplusia ni* (Hbn.)), the imported cabbageworm (*Pieris rapae* (L.)), the diamondback moth (*Plutella maculipennis* (Curt.)), the corn earworm (*Heliothis armigera* (Hbn.)), the fall armyworm (*Laphygma frugiperda* (A. & S.)), and several species of climbing

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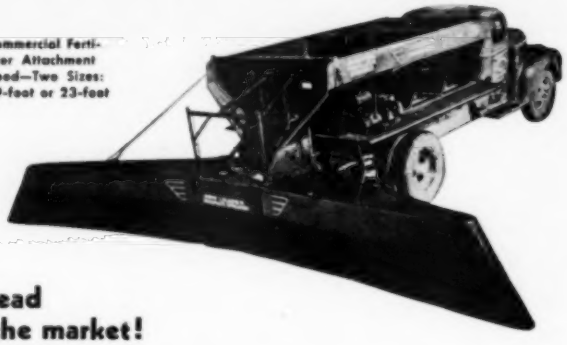

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cutworms, including the granulated cutworm (*Feltia subterranea* (F.)).

In general, insecticides containing pyrethrum proved more effective against the cabbage looper than those containing rotenone. The reverse was true of the imported cabbageworm and the diamondback moth. Neither of these insecticides gave satisfactory control of the Agrotinae. The auxiliary materials usually were of most value in pyrethrum insecticides in the control of the imported cabbageworm and diamondback moth, and in rotenone insecticides in the control of the cabbage looper.

Impregnated pyrethrum dusts usually proved more effective against the caterpillars than ordinary dust mixtures of the same pyrethrins content, but they were more difficult to blend and apply. An impregnated rotenone dust was no more effective against the caterpillars than an ordinary dust of the same rotenone content.

The auxiliary materials that proved of significant value were mineral oil, mineral oil and sulfur, piperonyl cyclonene, and an organic thiocyanate. Very few comparisons were made between these additives in any one experiment. Rotenone dusts containing 2 percent of oil proved superior to those containing 2 percent of a commercial thiocyanate said to contain 50 percent of oil.

A combination of 2 percent of mineral oil and 10 percent of dusting sulfur gave the highest increases in caterpillar control. Piperonyl cyclonene apparently increased the effectiveness of low-strength pyrethrum or rotenone dusts, but even the mixtures did not always give adequate caterpillar control. The looper control afforded by a 1-percent rotenone dust was increased significantly by the addition of 0.5 percent of piperonyl cyclonene, but this additive did not sufficiently improve a 0.3-percent pyrethrins dust to control a heavy cabbage looper infestation.

Indalone, methylated naphthalene, n-propyl isome, piperonyl butoxide, and sulfur (used alone) did not prove of significant value when added to pyrethrum and rotenone insecticides, but they usually tended to increase their toxicity to one or more species of caterpillars.

Rotenone and pyrethrum dusts with flaky talc, sulfur, or pyrophyllite as the diluent, were generally more effective against the cabbage looper and the larvae of the diamondback moth than the same dusts diluted with kaolin. A rotenone dust containing pyrophyllite was more effective against the looper when freshly mixed than when it was 6 months old, but the age did not affect significantly rotenone dusts prepared with sulfur, talc, or kaolin.

Summary of U.S.D.A. Bulletin E-834, "Value of Auxiliary Materials in Rotenone and Pyrethrum Insecticides for Control of Cabbage Caterpillars," by W. J. Reid, Jr., and F. P. Cuthbert, Jr., U.S.D.A.

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Systemic Fungicide Test

Several groups of compounds reported as chemotherapeutants were tested for their ability to reduce the intensity of chocolate-spot disease of broad bean. In general, the compounds which had been reported as effective against other diseases effected some reduction in leaf-spot percentage.

With the azo dyes and the hydroxyquinolines there was also some correspondence between the behavior of indivdual members of the groups in their effect on different diseases.

In most cases there was no close relationship between the activity of the compounds in spore germination tests and their behavior on broad bean. However, only the azo dye with fungicidal potency was effective.

—Summary of article, "Studies on Systemic Fungicides. Behavior of Groups of Reported Chemotherapeutants" by S. H. Crowdy and Mary-Elizabeth Davies, Rhode Island Agricultural Experiment Station, Kingston, in *Phytopathology*. Vol. 42, No. 3, March, 1952.

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Herbicides as Study Tool

A review of the literature on the early work on the effect of cultivation compared with no cultivation (plots kept weed-free by scraping) on corn revealed that in the scraping plots the soil surface had been disturbed. This disturbance of the soil allowed an interchange of soil-air gases, especially oxygen, at the soil-air interface. It is believed that these earlier experiments were not fair comparisons between cultivated and non-cultivated corn plots. With the advent of herbicides, a new tool is available for checking on the effect of cultivation versus no cultivation.

Corn plots were set up on a Cheshire loam soil in 1948 and 1949 to test the significance of cultivation on corn growth. During those years, unusually heavy rains fell, packing the soil. Later in the season, it became unusually hot and dry, baking the soil and forming a hard crust on the surface.

Comparisons were made in 1948 between cultivation, pre-emergence 2,4-D, and flame + one cultivation (coincided with last cultivation of cultivated plots) treatments for weed control; in 1949, these treatments were cultivation, scraping, 2,4-D only, 2,4-D + one cultivation. Post-emergence applications of 2,4-D were made about 50 days after the initial application.

Comparison of the corn yields with the physical nature of the soil shows the importance of good soil structure on crop growth. Yields in 1948 for cultivated versus 2,4-D treated plots were 61.5 and 15.2 bushels, respectively; in 1949, they were 94.6 and 68.3. In 1948, the cultivated plots had 20 per cent more large soil pores in the surface 2 inches than the 2,4-D treated plots; in 1949, this difference was 11 per cent.

The effect of cultivation in breaking the soil crust is brought out by cultivating the flamed plots once corresponding with the last cultivation of the cultivated plots. The flamed corn yielded only 8.8 bushels less than the cultivated corn. In 1949, plots treated with 2,4-D + one cultivation yielded 9.9 bushels less than the cultivated ones. In 1948, the flamed corn became darker green in color after cultivation, indicating greater nitrification activity in the soil. In 1949, nitrate nitrogen studies of the 0-8 inch depth showed that immediately after cultivating the 2,4-D + cultivation plots the nitrate nitro-

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gen content was up from 87.9 to 101.4 pounds per acre.

Penetrometer studies in 1949 revealed that 78 per cent more force was required to break through the surface 2 inches of soil in the 2,4-D treated plots than in the cultivated ones.

Weeds in the 2,4-D plots were controlled initially for the first month. It was estimated that weed competition was reduced to about 60 to 75 per cent control in the latter part of the season.

—Summary of "Herbicides: A new Tool for use in Studying Soil Physical Properties Affecting Crop Growth," by C. L. W. Swanson & H. G. M. Jacobson, Connecticut Agri. Exper. Station, New Haven, in "Weeds," January, 1952.

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Parathion & Dairy Cows

Parathion, in the form of an excessively heavy experimental residue of approximately 14 parts per million on baled alfalfa hay, was fed over a 61-day period to five dairy cows in mid-lactation and representing four of the major breeds. The average parathion intake for all cows during the experimental period was 166.9 milligrams of parathion per cow per day or 0.33 milligram of parathion per kilogram of cow body weight per day. Neither parathion nor free *p*-nitrophenol, a probable hydrolytic product of parathion, ever was found in the milk or jugular blood of these experimental animals. The feeding of parathion as a forage residue at this rate had no adverse effects on the milk production, weight, and general health of the cows.

The degradation and detoxication of parathion was studied further in a second series of experiments in which parathion, as a commercial wettable powder, was fed in capsules at increasing rates of from one to 32 milligrams of parathion per kilogram of cow body weight per day. No parathion, free *p*-nitrophenol, or free *p*-aminophenol ever was found in samples of jugular blood, urine, and milk taken during the experimental period. Experimental evidence indicates that the parathion must be hydrolyzed *in vivo* to *p*-nitrophenol, reduced to *p*-aminophenol, conjugated with glucuronic acid to an appreciable extent and then excreted in the urine as *p*-aminophenylglucuronide. The fate of the thiophosphoric acid portion of the parathion molecule was not determined.

—Summary of "The Degradation and Detoxification of Parathion in Dairy Cows," by J. E. Pankaskie, F. C. Fountaine and P. A. Dahm, Kansas Agricultural Experiment Station, Manhattan, in *Journal of Economic Entomology*, Vol. 45, No. 1, February, 1952.

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"Malathon" Data Published

American Cyanamid Co., New York, has issued information on its new insecticidal product, malathon, common name for O,O-dimethyl dithiophosphate of diethyl mercaptosuccinate, also known as "Experimental Insecticide No. 4049."

The material is described as being slightly soluble in water; miscible with many organic solvents including alcohols, esters, ketones, ethers, aromatic and alkylated aromatic hydrocarbons and vegetable oils. It has "very limited" solubility in certain paraffinic hydrocarbons without the use of a mutual solvent, the bulletin says.

As to compatibility, malathon decomposes most rapidly under conditions where the pH is above 7.0 or below 5.0. No hydrolysis was obtained for 336 hours in an aqueous solution buffered to initial pH of 5.26. At a pH of 7.5, hydrolysis was 11% in 22 hours. When alkaline insecticides and fungicides are added to the spray tank with formulations containing malathon, the initial kills are satisfactory but the residual toxicity is decreased.

According to preliminary information, both the wettable powder and the emulsion may be used with more commonly-used insecticides. In tests in 1950 and 1951, formulations containing "malathon" were used successfully with DDT, lead arsenate, methoxychlor, mineral oil, parathion, TDE, ferbam, nabam, tribasic copper sulfate, wettable sulfur, zineb and ziram. Neither phytotoxic effects nor decrease in insecticidal efficiency were reported with these combinations.

After extensive tests as a spray and in an aerosol on ornamental plants out of doors and under glass, the material seems to have "exceptionally good" plant tolerance to a wide variety of plants.

Among insect pests on which malathon has been effective, are European red mite, two-spotted spider mite, Williamette mite, Pacific mite; clover mite, Schoenii mite, woolly apple aphid, fruit tree leaf roller, black cherry aphid, pear psylla, mealy plum aphid, Mexican bean beetle, imported cabbage worm, green peach aphid, pea aphid, pea weevil, potato aphid, turnip aphid, hop aphid and green peach aphid.

Experiments have been made on other insect pests, but further work needs to be done before recommendations are made, the bulletin states.

No effect on either flavor or quality of fresh apples, sweetened or unsweetened applesauce, string beans and broccoli was detected in taste tests by panels of twenty or more persons during 1950. Neither was off-flavor noticed in fresh or canned tomatoes, tomato juice, canned lima beans, potato chips or frozen broccoli by cooperating State Experiment Stations during 1951. However, further studies are needed to clarify the possibilities of malathon imparting a flavor on certain crops before a definite decision can be made with reference to these crops. Many residue studies have also been made, to indicate that malathon does not persist for extended periods.

Toxicological studies thus far indicate that malathon, when administered orally, gave symptoms of cholinesterase inhibition. In experiments made to determine the dermal acute toxicity, the cutaneous penetration by malathon was found to be of relatively low order, in marked contrast to most of the organic phosphates used as insecticides. Studies are continuing to gain data on chronic toxicity.

A REVOLUTIONARY NEW INSECT KILLER!

SYSTOX, a revolutionary new type of insecticide, has just been approved for the control of aphid and two-spotted spider mite on cotton. Unchecked, these killers could destroy the nation's cotton crop.

SYSTOX is the first true *systemic* insecticide ever approved for use in this country. Its dramatic method of control promises enormous new benefit to American agriculture. Absorbed and translocated through foilage and roots, SYSTOX renders plants highly toxic to many destructive insects for a considerable period of time.

Approval of SYSTOX for controlling these cotton insects climaxes three years of intensive research by the Pittsburgh Agricultural Chemical Company and its associate, Chemagro Corp., following its original development by Farbenfabriken Bayer, Germany. Results of this work indicate that SYSTOX...

- ...renders most plants toxic to insects three to four times longer than conventional insecticides.
- ...is effective when applied in doses as small as one ounce of pure SYSTOX per acre.
- ...can be effectively applied to seeds before planting, thus protecting the young plants for a considerable period.

SYSTOX also appears to be effective in controlling many common insects which attack fruits, vegetables, grains, forage crops, sugar and tobacco, and its ultimate use on these crops is indicated. Research also indicates that only harmless traces of SYSTOX residue—measured in tenths of parts-per-million—remain in the harvested crops.

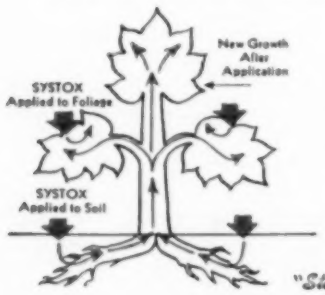
Approval for the initial use of this amazing new insect killer marks a significant milestone in the fight of this nation's great agricultural and chemical industries against destructive insects.

Because of its vital importance, we are immediately making SYSTOX available to cotton growers in commercial quantities through our established outlets. SYSTOX will also be available to research organizations for experimental use on other crops.

PITTSBURGH AGRICULTURAL CHEMICAL CO.

Empire State Building, New York, N. Y.

W&D 4203



SYSTOX is absorbed through roots or foliage and translocated throughout plant structure, including any new growth developed after application.

"Standard for Quality"

A DIVISION OF

PITTSBURGH
COKE & CHEMICAL CO.

Grant Building, Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

INDUSTRY NEWS

Shell Buys Hyman Co.

Shell Chemical Co., New York, has completed arrangements to buy Julius Hyman & Co., Denver, and has also entered into an agreement with the Velsicol Corporation, Chicago, for exclusive world-wide rights to aldrin and dieldrin. This assures continued availability of these two important new insecticides which have been involved in lengthy litigation between Velsicol Corporation and the Julius Hyman Company. Shell has marketed aldrin and dieldrin ever since their commercial introduction in 1950.

Julius Hyman & Co. will continue to be operative under its present name, according to an announcement on May 1st, by Jan Oostermeyer, president of Shell Chemical Co. "We expect not only to continue production of aldrin and dieldrin," said Mr. Oostemeyer, "but also to accelerate development of new products."

The Hyman Denver plant, employing about 800, will continue in operation and plant and technical personnel will be retained.

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Pacific Slope AAEE Meets

The Pacific Slope Branch, American Association of Economic Entomologists will hold its 36th annual meeting at the Hotel Mar Monte, Santa Barbara, California, June 24, 25 and 26. Headquarters will be at the Mar Monte, but meetings will be held in the Cabrillo auditorium on the beach.

Included on the program are reports on the current status of work with systemic insecticides, world-wide entomological programs, off-flavor evaluations, economic poison usage, radio-active tracer studies with economic poisons and other subjects of interest to the trade.

•

To Build Huge Fert. Plant

A more-than twenty million dollar ammonia-urea plant will be erected in the "very near future" by W. R. Grace & Co., international industrial and trading concern, according to an announcement by the company's president, J. Peter Grace, Jr. It is understood that the site will be in the middle west.

The plant, with a daily capacity of 250 tons, will synthesize the ammonia from natural gas; part of this ammonia will be converted to urea. The products will be sold for agricultural and industrial use.

Grace has had many years experience in the chemical field in South America. Its experience in the fertilizer field dates back to the founding of the firm nearly 100 years ago when it started to import Peruvian guano and later Chilean nitrate into the U. S. in important quantities. Grace's wholly owned subsidiary, Naco Fertilizer Company, with plants in the Carolinas, Florida, Ohio and California is a large consumer of nitrogen. Plans already are underway for the integration of other petrochemical manufacturing operations into the new Grace plant.

•

Wyandotte Names Craig

John L. Craig has been appointed sales representative at the Cincinnati office of Michigan Alkali Division, Wyandotte Chemicals.

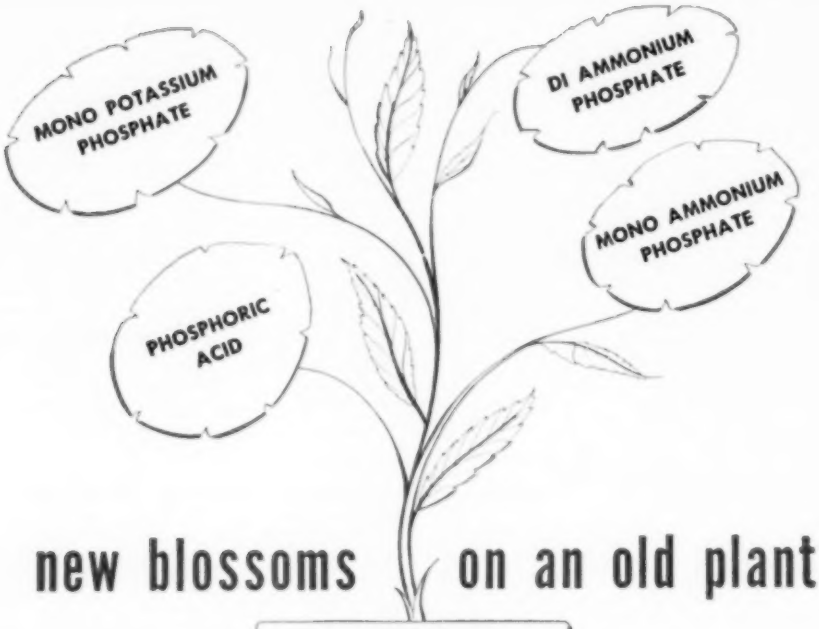
Hercules Announces Personnel Changes

Hercules Powder Co., Wilmington, Del., announced recently the appointment of R. T. Yates as assistant director of sales in charge of agricultural chemicals for its Naval Stores department. Herbert M. Wendle was named as assistant director of sales in Naval Stores, for resin & terpene chemicals. Mr. Wendle was manager of the department's New York office for seven years prior to his recent appointment. At the same time, Frank U. Rapp was named sales manager for Agricultural Chemicals, and R. J. Both was appointed assistant sales manager. Dr. E. N. Woodbury was named chief entomologist.

The Hercules Naval Stores Department announced also the following changes: J. H. Neal, toxaphene sales representative in the Southeast, is transferred to San Francisco and appointed manager of the department's district office there. L. P. Killilea is transferred from Chicago to become manager of the department's New York district office. L. E. Anderson is transferred from San Francisco to become manager of the department's Chicago district office.

RICHARD YATES

FRANK U. RAPP



new blossoms on an old plant

This is good news in agriculture and in industry. Increased availability of vital plant nutrients in the form of soluble inorganic salts for fertilizer solutions can mean new products and new markets for fertilizer manufacturers.

New emphasis is being placed upon WATER-SOLUBLE FERTILIZERS. Growers and manufacturers are developing new methods . . . new applications of high-analysis soluble plant foods which combine NITROGEN . . . PHOSPHORUS, POTASH and, in many cases, weed killers and insecticides, too.

MONSANTO, to help meet the increasing demands for plant foods, has increased quantities of four basic, soluble fertilizer chemicals . . . MONO AMMONIUM PHOSPHATE . . . DI AMMONIUM PHOSPHATE . . . MONO POTASSIUM PHOSPHATE . . . PHOSPHORIC ACID 75.0%.

New uses for WATER-SOLUBLE FERTILIZERS are proving profitable for growers . . . profitable for FERTILIZER MANUFACTURERS. Perhaps these products will fit into your production planning. Contact any District Sales Office, or write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700-B South Second Street, St. Louis 4, Mo.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto Canada Limited, Montreal.

MONSANTO PLANT NUTRIENT CHEMICALS

	N	P_2O_5	K_2O
Mono Potassium Phosphate (Crystals)	—0—	51.6%	34.2%
Di Ammonium Phosphate (Crystals)	21.0%	53.85%	—0—
Mono Ammonium Phosphate (Crystals)	12.2%	61.61%	—0—
Phosphoric Acid (75.0%) (Liquid)	—0—	54.5%	—0—

Anderson Velsicol SR

M. L. Anderson was recently appointed southwestern insecticide sales representative for Velsicol Corp.,

M. L. ANDERSON

Chicago. Mr. Anderson will have his headquarters in Texas.

He was formerly associated with Virginia Smelting Co., West Norfolk, Va. as manager of aerosol sales, and the Florida State Plant Board.

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Eston Adds to Plant

Eston Chemicals, Inc., Los Angeles, has just completed a major addition to its agricultural chemical plant. New facilities include grinding and blending equipment for DDT, BHC, toxaphene and other basic insecticide concentrates. A new warehouse and loading platform has also been constructed. Total cost of additions is in excess of $50,000.

Eston is a pioneer west coast producer of agricultural chemicals including tetraethyl pyrophosphate, parathion, ethylene dibromide and methyl bromide. The products are sold principally to basic distributors and blenders throughout the Far West and Southwest.

•

New Thurston Mo. Plant

Acquisition of Thurston Chemical Company's fourth fertilizer plant has been announced by William R. Thurston, president of the company.

Final arrangements for a long term lease of a plant in Trenton, Missouri, have been made with Fred Payne, Trenton financier and contractor. Mr. Payne is constructing a new building on Thurston's specifications. It is designed specifically to serve as a modern fertilizer mixing plant and will be fully equipped and operated by Thurston Chemical Company. It is hoped to have the plant in operation by July of this year.

The Trenton plant will have an annual capacity of approximately 25,000 tons of commercial fertilizer per year, bringing the company's total annual capacity to 275,000 tons. The Thurston company already operates plants in Joplin, Mo., Tulsa, Okla. and Lawrence, Kansas.

The new plant will serve dealers in northern Missouri and southern Iowa.

MEETINGS

Fertilizer Safety Section of the Virginia State Safety Conference. Richmond, Va., May 16.

Chemical Specialties Manufacturers Association. Copley-Plaza Hotel. Boston, Mass., June 8-10.

Conference on Use of Isotopes in Plant and Animal Research. Kansas Agricultural Experiment Station. Manhattan. June 12-14.

National Fertilizer Association. Greenbrier Hotel. White Sulphur Springs, W. Va., June 16-18.

Meeting of Advisory Committee of Fertilizer Section of National Safety Council. Greenbrier Hotel. White Sulphur Springs, W. Va., June 19.

American Plant Food Council. Homestead Hotel. Hot Springs, Va., June 19-22.

Pacific Branch, A.A.E.E., Mar Monte Hotel. Santa Barbara, California. June 24-26.

Soil Improvement Committee, Pacific Northwest Plant Food Association. Pocatello, Idaho. July 9, 10 & 11.

Sixth International Grasslands Congress. Penn State College, State College, Pa., August 17-23.

29th National Shade Tree Conference, Hotel Statler, Boston, Mass., August 18-22.

American Phytopathological Society, Cornell University, Ithaca, N. Y., September 9-12.

National Pest Control Association. Rice Hotel. Houston, Texas. October 20-22.

Meeting of Fertilizer Section of National Safety Congress, Chicago, Ill., October 22 & 23.

Sixth Annual Beltwide Cotton Mechanization Conference. Bakersfield, California. Oct. 22-24.

California Fertilizer Association. Desert Inn. Palm Springs, Calif., Nov. 10-12.

Joint meeting, North Central Weed Control Conference and Western Canadian Weed Conference. Royal Alexandra Hotel. Winnipeg, Canada. December 8, 1952.

Shell Advances Huldrum

G. W. Huldrum, Jr., was recently appointed sales manager of the Western division of Shell Chemical

G. W. HULDRUM, JR.

Corp., New York, according to an announcement by L. V. Steck, vice-president. Mr. Huldrum has been with Shell Chemical since 1939, starting out as a chemist in the Pittsburgh, Calif. plant. In his new position, he will head sales activities in ammonia and ammonium sulfate fertilizers, solvents for varnishes and lacquers, plastics and resins.

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Md. Safety Conf. Held

A safety-health conference, including a section on fertilizer plant safety, was to be held at Baltimore, Md., May 8 & 9, under the auspices of the Maryland State Industrial Accident Commission and the Department of Safety. Headquarters were to be the Lord Baltimore Hotel.

The session on fertilizer plant safety was to be under the chairmanship of A. B. Pettit, Davison Chemical Corp., Baltimore. Moderator was to be Walter W. Lehle, assistant to the director of operations, Mathieson Chemical Co., Baltimore. Discussion leaders were to include Ralph Fraser, vice-president, Summers Fertilizer Co.; T. M. Bloom, superintendent, superphosphate and mixed fertilizer plants, Davison, Chemical Corp.; George F. Dietz, safety director, Fertilizer Manufacturing Cooperative, Inc.; and F. W. High, manager of operations, Baugh Chemical Co.

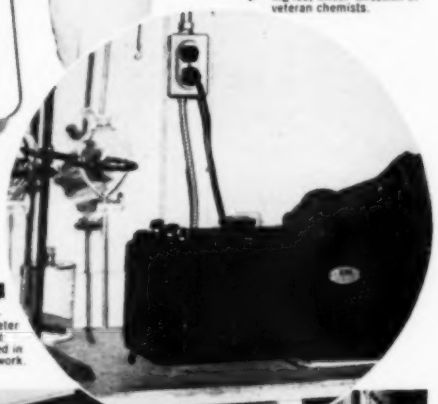
Thompson-Hayward's testing lab, under direction of veteran chemists.

Insistence on Integrity!

QUALITY control in pesticides doesn't just happen. It takes sharp, unsatisfied eyes that okay nothing until it has been tested and proved . . . and then okay only that batch. Questioning, testing eyes!

In our laboratories, careful routines are set up for mixing, measuring and packaging. More important, instructions to the chemists go something like this: "Take nothing for granted. Accept no rule of thumb. Approve nothing just because somebody else did." That is our quality control platform.

Tell your customers about this. Sell quality when you sell Thompson-Hayward pesticides. You'll sell more!



Spectrophotometer of latest type used in testing work.

Automatic titrator used in titrations.

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This product has been carefully examined and found to conform with our specifications.

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This certifying tag must be on every container of Thompson-Hayward chemicals.

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CHEMICAL COMPANY
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TULSA

Committee Stresses Greater Sulfur Output

NECESSITY for developing and expanding sulfur conserving methods for the production of superphosphate fertilizer materials was emphasized by the National Production Authority at a meeting with the Phosphatic Fertilizers Industry Advisory Committee in Washington recently. George M. Hebbard of NPA's Chemical Division, presided.

NPA pointed out that the Department of Agriculture's estimated requirement for superphosphates by 1955 is 3,485,000 tons, or almost 75 percent more than the approximate 2,000,000 tons which it is expected will be produced this year under the sulfur use limitations of NPA's Sulfur Order M-69, Amended. In addition, the nation faces a stringent sulfur supply situation for some years to come, NPA said.

Representatives of the Tennessee Valley Authority and the USDA outlined methods of producing superphosphates whereby considerable quantities of sulfuric acid could be conserved. The TVA spokesman said that sulfuric acid consumption can be almost halved by acidulating phosphatic rock with a mixture of sulfuric acid and nitric acid. By ammoniating the resultant slurry, a nitrophosphate is produced which contains both nitrogen and phosphorus, two of the three important fertilizer elments. The other is potassium.

The USDA spokesman discussed four methods used commercially in Europe and Asia for the production of superphosphates. The methods are non-acid processes and involve the alkali treatment of phosphatic rock in electric furnaces or in cement type kilns using small quantities of coal.

The four methods call for (a) the smelting of phosphatic rock with or without alkali salts or silicates, (b) heating phosphatic rock in a rotary kiln with susbequent defluorination, (c) heating of phosphatic rock with magnesium silicate in an electric furnace, and (d) heating of phosphatic rock with soda ash.

An NPA official said that the fertilizer industry has been given a real challenge to meet the Agriculture Department's forward requirements of phosphatic fertilizers by adoption of one or more of the newer methods of manufacture providing means for the conservation of sulfur. Without such new methods being put to commercial use, he said, the chances of reaching the new goals for phosphates are very slim.

In Photo Below:
At table, left to right: R. R. Hull, I. P. Thomas & Son Co.; Ray L. King, Ga. Fertilizer Co.; A. R. Mullen, Indiana Farm Bur. Co-op.; S. L. Nevins, Mathieson Chem. Corp.; J. W. Rutland, International Minerals & Chemical Corp.; R. S. Rydell, Swift & Co.; I. R. Scherm, American Ag. Chemical Corp.; W. R. Thurston, Thurston Chemical Co.; Roger Mullin, Counsel, Chem. Div., NPA; W. B. Allstetter, USDA; G. M. Hebbard, Fred Fraley, and Philip H. Groggins of Chem. Div., NPA; C. T. Cunningham, Armour Fertilizer Works; F. W. Darner, Tennessee Corp.; J. C. Dean, Knoxville Fertilizer Co.; R. N. Douglass, Smith-Douglass Co., Inc.; M. F. Field, Meridian Fertilizer Co.; E. W. Forkin, Forkin Phosphate Co.; R. E. Fraser, Summers Fertilizer Co.; R. L. Hockley, Davison Chem. Corp.; and J. A. Howell, Virginia-Carolina Chemical Corp.

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Bemis Appointments Made

R. D. McAusland has been named director of western operations and F. V. Deaderick, director of eastern operations for Bemis Brothers Bag Company. In their new positions, Mr. Deaderick and Mr. McAusland will be responsible for both production and sales of Bemis products in their territories.

Mr. McAusland will supervise Bemis plants at Seattle, Vancouver, San Francisco, Wilmington, California, and Los Angeles, as well as the Seattle, San Francisco, and Los Angeles sales divisions. Mr. Deaderick will supervise the Bemis plants at Buffalo, Brooklyn, Norfolk and East Pepperell, Mass., and the Buffalo, Brooklyn, Norfolk, New York General and New York sugar bag sales divisions.

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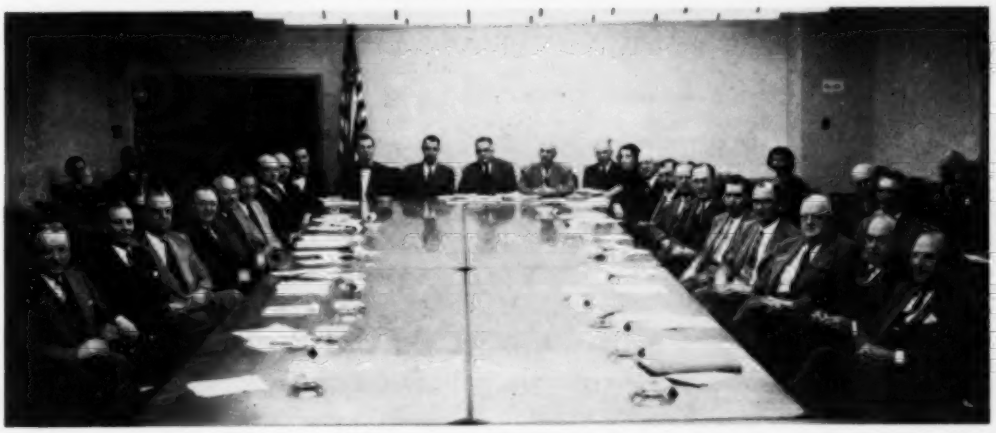
Resin Soil Conditioner

Wilson Organic Chemicals, Inc., Sayreville, N. J. announced recently the commercial production of "Poly-ack" a new resin-type of soil conditioning agent said to improve soil structure by increasing aeration, retarding moisture loss through evaporation and improving drainage.



Fertilizer is our business, too!

- √ Fertilizer Mixing Plants
- √ Triple Superphosphate Plants
- √ Single Superphosphate Plants
- √ Warehouses
- √ Granulating Plants
- √ Ammonium Sulphate Plants
- √ Storage Buildings
- √ Material Handling Systems
- √ Sulphuric Acid
- √ Phosphoric Acid

Many years of experience in the fertilizer industry have given the Harte Company valuable "know-how" about the development and application of the fertilizer processes. Apply the Harte System to your project and this storehouse of knowledge becomes available. If you plan to build a fertilizer mixing plant or an associated plant, the Harte organization can handle your complete job or any part from original design to an operating plant . . . anywhere, assuring economy and speed.

John J. Harte Co.
ENGINEERS
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Always Reliable Quality

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Calcium Arsenate
Calgreen
Chlordane Dusts
Chlordane Sprays
Cuber (Rotenone) Dusts
DDT Dusts & Sprays
Hi-Test Lead Arsenate
Parathion Dusts
Parathion Sprays
Paris Green

Potato Dusts
Tomato Dust
Toxaphene Dusts
Toxaphene Sprays

Copper Hydro
Copper Hydro Bordo
Dry Lime Sulfur
Sulfur Dusts
Wettable Sulfur

Shed-A-Leaf—Defoliant

Aflacide—Weed Killer
Atlas "A"—Weed Killer
Chlorex Spray Powder
Methoxone—Weed Killer
Sodium Arsenite
Sodium Chlorate
2,4-D Sprays & Dusts
2,4,5-T Esters

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Seed Protectants

CHIPMAN CHEMICAL CO. DEPT. A., BOUND BROOK, N. J.
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Manufacturers of Weed Killers Since 1912 Of Insecticides Since 1921

Write for 1952 Products Booklet

Virginia Enacts New Fertilizer Law

A NEW state fertilizer law to succeed the 75-year-old statute in the State of Virginia, was signed by Governor Battle on March 11 following a unanimous vote of approval by the State's General Assembly. The new law will become effective July 1, 1952, and copies of it were expected to be available about April 15.

Virginia's Governor John S. Battle signs state's new fertilizer law while Paul D. Sanders (L). editor of "The Southern Planter" and State Commissioner of Agriculture. Parke C. Brinkley, look on.

The new fertilizer law does not change the fundamental principles of the former law, which had proved adequate in the control of fertilizer sales. It provides full protection to the purchaser, fair competition in the sale of fertilizer to meet the needs of the farmer and eliminates some of the obstacles encountered in the interstate movement of fertilizers, particularly between Virginia and North Carolina. The new law establishes definitions of terms, provides for uniform labeling and removes the limit on the number of grades which may be established by the Grade Committee.

The old law did not permit the sale of ground rock phosphate. The new law will permit the sale and use of ground rock phosphate when properly labeled to protect the purchaser. With the present shortage of sulphur which is used in the manufacture of superphosphate, it appears desirable that ground rock phosphate be made available for use as recommended by Virginia Experiment Station.

The enforcement of the Virginia Fertilizer Law is under the direction of Rodney C. Berry, state chemist and director of the Division of Chemistry. Records over the years show that Virginia farmers have been fully protected through rigid enforcement of fertilizer laws and the cooperative support by the manufacturers indicates confidence in the impartial performance of duties by Virginia control officials.

Penalty assessments are paid directly to the farmer and all of the 122 penalties assessed during the past year were paid by the manufacturer without court action. In fact, Mr. Berry could not recall a single case where a deficiency violation had been taken to court in Virginia.

The old Virginia fertilizer law was enacted about 75 years ago and was adequate to control the distribution of fertilizer and fertilizer materials at that time. The original Act had been amended from time to time to permit the sale of and provide control of new formulas of fertilizer recommended by the State experiment stations. As a result of these amendments, some sections of the law seemed to contradict other sections, and were in conflict with the laws of neighboring states.

Since a considerable tonnage of fertilizer moves in interstate shipment, the need for more uniformity in state laws regulating distribution has been recognized by all the states. About 5 years ago, the Model Fertilizer Law was suggested as a guide toward uniformity, establishing controls to meet needs on the local level. Some two years ago, a movement was started to bring the laws of North Carolina, South Carolina and Virginia into closer uniformity, and representatives of the three states met again in the spring of 1951. In the meantime, the S. Carolina fertilizer law had been amended and the N. Carolina law had likewise been completely revised and amended. The Virginia Department of Agriculture had begun a study of the law in that state, and, after many conferences between the Virginia Experiment Station, Virginia Truck Experiment Station and Tobacco Workers Committee, it was agreed that the Virginia law should be revised in order to meet present conditions.

Representatives of the State Farm Bureau Federation, State Grange and the Agricultural Conference Board, made up of some sixty organized farm groups in Virginia, were consulted and a tentative draft of a new fertilizer law was drawn up. Copies of this tentative draft were sent to all fertilizer manufacturers doing business in Virginia. All interested groups were invited to attend a public discussion of this draft in the Senate Chamber of the State Capitol on December 17, 1951. The draft was considered section by section and a number of changes were made. With the incorporation of the changes, there was practically unanimous approval by all interested parties. After review by the Legislative Drafting Bureau, the bill was introduced as Senate Bill No. 270.

Six years of world-wide applications have proved chlordane to be highly effective in the control of wireworms. In addition, it also controls a variety of other soil and air-borne insects that damage or destroy crops. It will pay you, too, to get the facts about chlordane effectiveness and ease of application in wettable powders, dusts and water emulsions, and fertilizer admixtures.

For the proper recommended dosages in your area consult your county agent. See your local insecticide dealer to-day.

CHLORDANE ALSO CONTROLS

Alfalfa Weevils	Onion Thrips
Cotton Boll Weevils	Plum Curculio
Cutworms	Seed Maggots
Earwigs	Serpentine Leaf Miners
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Japanese Beetles	Southern Corn Rootworms
Lygus Bugs	Termites
Mole Crickets	White Grubs
Onion Maggots	

. . . AND MANY OTHERS INCLUDING HOUSEHOLD PESTS.

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Exum to Barrett Div.

The Barrett Division, Allied Chemical & Dye Corporation, has announced the appointment of William J. Exum as sales manager of

WM. J. EXUM

Direct Application Liquid Nitrogen Materials — Barrett Ammonium Nitrate Ammonia Solutions, Solution 32 and Ammonia Liquor. In his new connection, Mr. Exum is handling the distribution of these materials for direct application to the soil. His headquarters are at 40 Rector Street, New York.

Mr. Exum was previously connected with Commercial Solvents Corporation where he was assistant manager of the Agricultural Division.

•

Wallach to H. J. Baker

John M. Wallach recently joined H. J. Baker & Co., New York, according to an announcement by the firm. Mr. Wallach was graduated from the University of Notre Dame and was formerly associated with Chilean Nitrate Sales Corp.

•

Myers Executive Dies

John C. Myers, 73, chairman of the board of directors of F. E. Myers & Bro. Co., Ashland, Ohio, died March 1 in Ashland. He had been associated with the company since 1902, and was president from 1933 until recently when he was elected to the position of board chairman. He was a member of the executive committee of the National Association of Domestic and Farm Pump Manufacturers and was a past president of the Farm Equipment Institute.

Mr. Myers was the son of Francis E. Myers, who with his brother, Philip A., founded the firm in 1870.

•

2nd Edition of "Weeds"

The second edition of "Weeds," Journal of the Association of Regional Weed Control Conferences, has been issued. The magazine contains technical papers covering use of 2,4-D in corn; application methods; news from the weed conferences and a bibliography of weed investigations for July, August and September, 1951.

R. D. Sweet, Cornell University, Ithaca, N. Y., is editor.

•

CFA Has New Emblem

The California Fertilizer Association has recently issued a new emblem which is being used by mem-

bers on company letterheads, fertilizer bags, personal cards and certificates for display on walls and desks of offices. CFA executive secretary and manager, Sidney H. Bierly, says that zinc plates (such as shown above), are available to members of the Association for various uses.

•

New Cal-Spray Plant

The California-Spray Chemical Co., Richmond, Calif., recently purchased twenty acres of land from the Lehigh Railroad in South Plainfield, N. J. for construction of a new plant.

New Thurston Appointees

James H. Gillie has been appointed general sales manager for Thurston Chemical Company of Joplin, Mo., and George Cupples has

JAMES H. GILLIE

been named as director of promotion. At the same time, Perry Onstot was named as agronomist and William Schaeffer as advertising manager. The appointments became effective Mar. 1.

Mr. Gillie joined Thurston Chemical in 1947. He has held positions in both the sales and advertising departments. For the past three years he has served as director of the Agriculture Information Department and has been active in working with the state agricultural colleges and farm leaders throughout the Midwest.

Mr. Cupples joined the company in 1945 as a member of the sales force, for a time serving as divisional sales manager for Missouri and Kansas. He also served as director of the Sales Research Department and the past two years has been engaged in public relations and promotional work.

Mr. Onstot is a graduate of the University of Missouri where he received his bachelor of science degree in agriculture in 1948. For the past four years he has engaged in Vocational Agriculture and FFA Work. He joined the company March first.

Mr. Schaeffer joined the company in 1948 as a member of the advertising department and has been associated with that department since then.

CONTROL { INSECTS / WEEDS / FUNGUS / FERTILIZER } AT LESS COST WITH...

WARREN Hi-Clearance

HEAVY-DUTY self-propelled SPRAYER

because it's built for dependable year 'round operation

Owners say, "Warren keeps our entire spray program on the ground. Costs per acre are low—chemical control is more effective."

Warren is fast and versatile—works equally well in high or low crops. It's adaptable to year 'round spraying of insecticides, fungicides, herbicides and will apply liquid fertilizer.

Buy Warren and you get a machine that will handle your complete spray program. ***Some of the largest canners and commercial operators own fleets of Warren Sprayers.***

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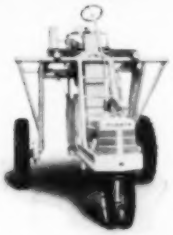

CHECK THESE CROP-SAVING FEATURES

- Pump capacity up to 20 g.p.m.
- Pump pressures up to 800 lbs.
- Crop clearance—7 feet.
- Mechanical agitation in 275-gal. tank.
- Welded tubular construction.
- Powered by 24 h.p. International.

WARREN DIVISION—AMERICAN STEEL DREDGE CO. INC.
DEPT. AC—FORT WAYNE, INDIANA

Simonds to Stauffer

James J. Simonds was recently appointed entomologist for the Stauffer Chemical Co., New York. Mr. Simonds, who will have his home

JAMES J. SIMONDS

office in Houston, Texas, graduated from Texas A & M College, where he majored in entomology. He was formerly associated with Tide Petroleum Company of Edinburgh and the U. S. Bureau of Entomology and Plant Quarantine.

■

N.E.W.C.C. Proceedings Out

The Northeastern Weed Control Conference has published the proceedings of its sixth annual meeting in a 26-page book. Copies are available from the group's secretary, Dr. W. C. Jacob, Dept. of Vegetable Crops, Cornell University, Ithaca, N. Y. Price is $3.

The book carries the entire proceedings of the three-day meeting held at the New Yorker Hotel, New York City, January 2, 3 & 4, 1952.

•

Alvarez to CSC

Orlando J. Alvarez was recently appointed regional manager for the export division, Commercial Solvents Corp., New York, according to an announcement by T. P. De Farkus, general manager of the export division. Mr. Alvarez is a native of Costa Rica and attended City of London College and the London College of Economics in England. He will be responsible for the development of the company's business in Central America and the Caribbean area. His headquarters will be in New York.

•

Pacific Guano Changes

Pacific Coast Guano Co. has announced three recent changes in personnel. George P. Bloxham, for many years a prominent figure in California fertilizer manufacturing circles, has become assistant manager of the Southern Division. He was for many years associated with Wilson & Geo. Meyer & Co. Howard Conley, has been appointed assistant general manager of the company, and is moving to Berkeley, Calif., where he will make his new headquarters. J. J. Bingham is the new manager of the company's Insecticide Division with headquarters at Berkeley. He has been in charge of insecticide sales in the Southern Division for the past two years. The announcements were made by Weller Noble, Berkeley, president of the company.

•

Scott Named Supervisor

Robert C. Scott was recently appointed supervisor of agricultural

ROBERT C. SCOTT

chemical research for the Pittsburgh Coke & Chemical Co. In his new capacity, Dr. Scott will direct all agricultural chemical research for the Pittsburgh Agricultural Chemical Co., a division of Pittsburgh Coke and Chemical Co.

Dr. Scott, who was born in Kingston, R. I., received his PhD. in organic chemistry from Syracuse University.

J. Meyer Rejoins Firm

Jeffery W. Meyer has rejoined Wilson & Geo. Meyer & Co., Pacific Coast distributors of agricultural and industrial chemicals and

JEFFRY W. MEYER

other products, having been released from active duty as a first lieutenant with the Chemical Corps, U. S. Army.

Meyer will be located in the San Francisco office of the firm which also maintains offices in Los Angeles, Portland and Seattle. He will serve in a managerial capacity, directing the sale of fertilizer materials, industrial chemicals, plastics and foundry coke.

Meyer is a veteran of World War II in which he served with the 32nd Infantry Division in the Philippine campaign. He is a great-grandson of the founders of the firm which is now more than 100 years old.

•

Borax Advances Klatt

W. L. Klatt has been named manager of the Denver District of Pacific Coast Borax Co., Division of Borax, Consolidated, Ltd. The Denver district sales office is the first to be established by the Weed Control Division. Mr. Klatt has been associated with Pacific Coast Borax Co. since 1947. During the past two and a half years, he has been assistant manager of the Weed Control Division.

J. R. Parke has become the Weed Control Division's representative in Philadelphia, the company has also announced. He was formerly associated with the Package Division.

RAX

prentiss warfarin concentrate

Jobbers! Packers! Manufacturers!

RAX POWDER — Prentiss' trade name for warfarin, the wonder rodenticide — is available for packaging under private label, or for manufacture in prepared baits that have long shelf life.

Full information on usage is yours for the asking. Ask also about the new, remarkably simple bait station (illustrated at left) — developed by Prentiss especially for warfarin baiting.

other prentiss products

DDT
TOXAPHENE
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FORMERLY R. J. PRENTISS & CO., INC.

110 WILLIAM STREET, NEW YORK 38, N. Y. — 9 SO. CLINTON STREET, CHICAGO 6, ILL.

To Monsanto Position

The appointment of Roy L. Brandenburger, St. Louis, as assistant to Felix N. Williams, vice-president and member of the executive committee, has been announced by Monsanto Chemical Company.

R. L. BRANDENBURGER

Mr. Brandenburger, manager of the Sanitation Farm Supply Division of Ralston Purina Company, St. Louis, was to join Monsanto on May 1 to work on special marketing problems.

A native of St. Louis, Mr. Brandenburger received a B.S.B.A. degree in commerce and finance from Washington University and has been associated with the Ralston Purina organization for 18 years.

•

S.D. Weed Conference

The South Dakota State Weed and Pest Control Conference was held in Huron, S. D. on March 20 and 21st. There were over twenty-five exhibitors and approximately 3000 persons attended the two day session.

•

Sees 10% More N Fertilizer

Supplies of nitrogenous fertilizers are expected to be about 10% higher during the current fertilizer year than during 1950-51. O. V. Tracy, Director of the Chemical Division of the National Production Authority, predicted on March 25th that total chemical nitrogen materials available for domestic agricultural use for 1951-52 will be approximately 1,414,000 short tons, which represents a 10% increase over the 1950-51 figure. Estimated supplies of normal and concentrated superphosphates for 1951-52 are: — Commercial superphosphate containing 18 percent phosphate including wet base goods, 9,272,000 tons; concentrated superphosphate containing 45 percent phosphate, 770,000 tons. The total amount of sulphuric acid (expressed as 100 percent H_2SO_4) which is expected to be available for the production of normal and concentrated superphosphates is estimated at 3,810,000 tons or only 40,000 tons less than was used during the calendar year 1950, the base period use for sulphur.

Commenting on the close balance between supply and demand for superphosphates in certain areas, Mr. Tracy said NPA questions the need for issuing a superphosphate distribution order so long as the phosphatic fertilizer industry continues to cooperate in eliminating distribution problems.

•

Opens Office in Buffalo

The Multiwall Bag Sales Division of the St. Regis Paper Company has announced the appointment of Kenneth L. Moore as manager of its newly created sales and engineering office in Buffalo, N. Y.

Mr. Moore, who has been handling sales in the northern New York area for the past two years, has been with the company since 1937. After working in all bag plant jobs, he took over as manager of the company's plant in Carthage, serving in this capacity for two years. For three years prior to assuming his position in sales, he was special assistant to the vice president in charge of bag manufacturing.

Union Special Machine Co. Elects Two

UNION Special Machine Co., Chicago, Ill., has announced that A. M. Sheldon was elected chairman of the Board of Directors, and at the same meeting, W. S. North was elected president and general manager of the company.

A. M. SHELDON

WILLIAM NORTH

Mr. Sheldon has been with the company since 1915, starting in the factory and then the sales department and general office. He was manager of the company's Philadelphia office in 1917 and three years later, in successive stages, was named general sales manager, secretary, general manager, and vice-president. In 1930 he was elected president and general manager to succeed the late Francis S. North.

William North, newly elected president, is the grandson of the company's founder, and son of Francis S. North. He joined the company in 1935 after graduating from the engineering school of Harvard Univ. Since then, he has worked through various departments, served as personnel director in 1941, vice-president in 1944 and assistant general manager in 1947.

Phillips Steps Up Output

Phillips Petroleum Corp. is taking steps to increase its production of ammonia and to recover sulfur from natural gas in West Texas. According to its annual report, issued recently, combined production of ammonia, ammonium nitrate and nitrogen solutions increased 24% over 1950's output, but production of ammonium sulfate was down 28% due to a lack of sulfuric acid.

Thus, the erection of two plants to recover 336,000 pounds of sulfur daily from natural gas was undertaken to alleviate the situation.

Construction has started on a plant at Adams Terminal, near Houston, Texas, to produce ammonia and thus help to meet the increasing demand for nitrogenous fertilizers.

In addition to the manufacture of chemicals for agricultural consumption, the company is also producing compounds for use in the manufacture of synthetic fibers.

PICCO hi-solv 30

a light petroleum solvent

for Insecticide Concentrates

This highly refined aromatic petroleum naphtha combines high solvency with the ideal rate of evaporation for insecticides. Extensive use has shown Picco Hi-Solv 30 to be an excellent vehicle for insecticides such as DDT, chlorinated camphene and the like.

We will be glad to send complete data and samples for testing.

PICCO

PENNSYLVANIA
INDUSTRIAL CHEMICAL CORPORATION
CLAIRTON, PENNSYLVANIA
Plants at Clairton, Pa., West Elizabeth, Pa., and Chester, Pa.

Named CSC Sales Mgr.

Robert E. Hayes was recently appointed district sales manager for the agricultural chemical division, Commercial Solvents Corp., New

ROBERT E. HAYES

York, according to an announcement by Clyde T. Marshall, general manager of the division. Mr. Hayes will have his office in Jackson, Miss.

Mr. Hayes, formerly associated with U. S. Steel as farm products agent in Mississippi, received his B. S. degree from Mississippi State College in 1929. He served as a paratrooper during World War II.

•

Mente to Sponsor Party

Mente & Co., New Orleans will sponsor a cocktail party at the sixth Joint Annual Convention of the Georgia Cottonseed Crushers Association and the Alabama-Florida Cottonseed Products Association to be held in Savannah on June 2nd and 3rd at the General Oglethorpe Hotel.

•

New Product for Am. Potash

A new product, "Tronabor" (crude pentahydrate borax) has been announced by American Potash & Chemical Corp. which is producing the material in commercial quantities at its Trona, Calif., plant. The company's pilot plant has been manufacturing relatively small quantities for the past several months.

"Tronabor" is said to provide a source of boron, needed by field and vegetable crops and many fruit crops.

AS WE GO TO PRESS . . .

Shell Chem. Names Keel

M. H. Keel has been appointed manager of a newly formed Advertising Department in Shell Chemical

M. H. KEEL
To Manage New Department

Corporation. In making the announcement, L. V. Steck, vice-president, said that the company's rapid growth has brought about a need for greater participation of advertising and sales promotion in marketing its expanding list of products to industry and agriculture.

Born in Lethbridge, Alberta, Canada, and a graduate of the University of Alberta (B.Sc.) and of the University of Michigan (M.S.), Mr. Keel joined the advertising staff of Shell Chemical Corporation in 1948.

In his new post, Mr. Keel will direct Shell Chemical's advertising, publications and sales promotion programs for agricultural chemicals, fertilizers, solvents, industrial chemicals and plastics & resins.

•

Paul Hoidale Retires

Paul A. Hoidale who has been in charge of grasshopper control activities for the U. S. Department of Agriculture since 1950, retired May 1 after 36 years in federal insect and plant disease control work.

Geo. Heller, duPont, Dies

George Heller, 55, division manager of the Agricultural Promotion Division of E. I. duPont de Nemours & Co., Inc., Wilmington, Del., died April 18 while on vacation at Miami Beach, Fla. His work at duPont included advertising and promotion of many products of the Grasselli Chemicals Dept.

Mr. Heller was a native of New Haven, Conn, and attended both New York and Columbia Universities in New York. He had been with duPont since 1928 and had held his last position since 1945.

The company had announced no successor at press time, but indicated that an appointment would be made within a short time.

•

OPS Regulation on Super.

With the issuance of CPR 137 on April 26, the Office of Price Stabilization put into effect the first tailored regulation to affect the fertilizer industry. The Act established a dollars-and-cents ceiling price on bulk sales of superphosphate. Ordinary and triple superphosphate are covered. Manufacturers making double superphosphate are to apply to the agency for information on their ceiling prices.

Tailored regulations for the fertilizer industry have been in the making for months, and this is the first one to come through. Four others, covering needs of potash producers, nitrogen producers, mixers and phosphate rock producers are yet to come.

On the basis of available phosphoric acid content, OPS has made the following designations: ordinary superphosphate, 21% or less available phosphoric acid content; double superphosphate, 22% to 39%; and triple superphosphate, 40% or more.

Penn Salt Names DesMarais

Hubert A. DesMarais has been appointed general sales manager of the Pennsylvania Salt Manufacturing Company of Washington, it has been announced by Fred C. Shanaman, president.

Mr. DesMarais, formerly Pacific Coast sales manager for the General Dyestuff Corporation, will locate in Tacoma.

Well known in chemical and

H. A. DesMARAIS

industrial fields in the West, Mr. DesMarais came to Portland, Oregon, in 1932 to open and mange the first General Dyestuff Corp. office there. He is a native of New Bedford, Mass., attended Cushing Academy at Ashburnham, Mass., and was graduated from Dartmouth College at Hanover, N. H., in 1926.

•

More Potash Imports Seen

Potash producers, in a meeting with the Defense Materials Procurement Agency in Washington, April 23, pointed out that increased imports of potash resulting from large scale expansion of foreign facilities, are presenting a major problem to domestic potash producers.

Imports of potash are arriving at the rate of 300,000 tons a year and France and Spain plan to expand their production to double the pre-World War II level. Competition with foreign goods is difficult because of the high wages being paid to workers in the U. S., industry leaders said.

Industry members present at

Commercial Adds to Staff

Additions to the staff of the research and development division of Commercial Solvents Corp., Terre Haute, Ind., were announced recently. These include: J. A. Frump as research chemist, formerly with Auto-Lite Corp., Vincennes, Ind.; G. R. Wagner as research chemist; L. P. Allen as microbiologist; and F. L. Walter as chemist in the analytical dept.

•

Buys Experimental Farm

Agricultural Chemicals, Inc., Llano, Texas recently purchased a 728 acre farm near Hampton, Miss., according to an announcement by H. E. Parish, manager of the company's Greenville branch plant and eastern division. Mr. Parish stated that the farm was purchased in order to carry on experiments with insecticide formulations produced by the company; new insecticides of promise, herbicides, application equipment and other tests of value to the farmer. The farm, to be named "De-Pester Farms" after the brand name of the company, will be managed by Victor Brock and the research program will be under the direction of S. L. Calhoun, consulting entomologist.

•

Potash Co. Transfers Woods

G. Albert Woods, sales representative in North and South Carolina for Potash Company of America was transferred recently from his headquarters in Raleigh, N. C. to the general sales office of American Potash Company in Washington, D. C. The Raleigh office was closed April 1. Mr. Woods will continue to be in charge in Carolina-Virginia territory.

•

Respirator Correction

In our April issue, an announcement was made of the new "Agri-Tepp" respirator manufactured by Willson Products, Inc., Reading, Pa. A letter from Robert P. Henry, of the Willson Co., points out that the news story was a little misleading in stating that the unit furnishes 8 hours' protection and can also be used for protection against parathion. Mr. Henry comments: "While this is basically true, we feel that it should have been noted that in order to provide protection against parathion, the "Agri-Tepp" filters would have to be removed from the respirator and replaced with the "Agrisol" cartridge and filter combination."

•

Cox Honored by Chemists

Dr. Alvin J. Cox, Palo Alto, Calif., a member of the advisory board of *Agricultural Chemicals*, was recently honored as a 50-year member of the American Chemical Society at the 121st annual meeting in Buffalo, N. Y. Dr. Cox received a diploma certifying a half-century of service.

•

Newt Hall Leaves Hyman

J. N. Hall, vice-president and sales manager of Julius Hyman & Co., concluded his service with the company on April 30 when Shell Chemical Co. assumed ownership and management of the company.

Mr. Hall, who was with the War Production Board's Chemical Bureau for 3½ years before joining Hyman, was in full charge of sales and marketing of Hyman products from the time the company was formed.

After taking a vacation of several weeks in Arizona, Mr. Hall hopes to re-enter the agricultural insecticide industry.

•

Pesticide Handbook Out

The Pesticide Handbook for 1952 has been published by College Science Publishers, State College, Pa. The handbook, compiled and edited by Donald E. H. Frear, professor of agricultural and biological chemistry, Penn State College, is priced at $1.25.

Divided into three general sections, the 178-page book contains a comprehensive list of trade names; a list of products arranged as to use (such as insecticides, herbicides, fungicides) with a further breakdown according to active ingredients. In the third section, the names of all manufacturers are arranged in alphabetical order followed by reference numbers of the products made by each. (These reference numbers correspond with those in the list of products in the previous section.)

Orders for the book should be sent to College Science Publishers, P.O. Box 798, State College, Pa.

•

Wants Sodium Selenate

A subscriber to *Agricultural Chemicals* writes that he is in the market for sodium selenate in 100-pound drums or more. Any firm having this material for sale should contact Philip P. Rosette, Kelly Agricultural Products Co., McKeesport, Pa.

•

Cyanamid Forms New Corp.

K. C. Towe, president of American Cyanamid Company, has announced the recent formation of a new corporation, Chemical Construction (Inter-American) Ltd. A Cyanamid subsidiary, with main offices in Toronto, Canada, Chemical Construction (Inter-American) Ltd. will design and build chemical plants in all nations of the Western Hemisphere except the United States. Its operations will parallel those of another Cyanamid unit, Chemical Construction Corporation, which designs and builds chemical plants in the United States and throughout the world.

President of the new company is W. R. Geddes, assistant to the president of North American Cyanamid Limited, wholly-owned by American Cyanamid Company.

•

Pacific Phytopaths To Meet

The thirty-fourth annual meeting of the Pacific Division of the American Phytopathological Society will be held at Oregon State College, Corvallis, Oregon, June 19-21, 1952. Included in the program will be sessions for presentation of papers, symposium sessions on "Nematodes," and "Legume Viruses," a field trip and a banquet. Officers of the division for 1952-52 are: President, Wm. B. Hewitt, University of California, Davis, California; Vice-President, E. K. Vaughan, Oregon State College, Corvallis, Oregon; Councilor, S. M. Dietz, Oregon State College, Corvallis, Oregon; and Secretary-Treasurer, George A. Zentmyer, University of California, Riverside, Cal.

Fungicide Report Issued

A book containing reports of field tests for the summer of 1951 has been issued by H. H. Robertson Co., Farmers Bank Bldg., Pittsburgh, Pa., presenting data on its fungicidal product containing over 90% copper (as Cu.). Tests are reported from the Agricultural Experiment Stations of Delaware, Florida, Indiana, Kentucky, Maine, Maryland, Michigan, New York, North Carolina, North Dakota, Ohio, Pennsylvania, and Virginia, with data indicating successful applications for control of anthracnose, late blight, early blight, and downey mildew on various crops in different states.

Robertson Fungicide is described as being a finely divided powder with a content of over 90% copper as Cu. The extreme fineness of the material is said to be advantageous to its function as a fungicide. The individual particles have a core of metallic copper surrounded by a film of cuprous oxide the thickness of which is approximately 1-½% the radius of the particle and amounts to approximately 20% of its weight.

The powder is an effective source of monovalent (cuprous) copper. The average particle diameter is slightly over 2 microns, with less than 5% being larger than 10 microns and with most in the range of from 1 to 5 microns. Particles are irregular in outline and so have over two times the surface area they would have if they were spherical in shape.

A pound of Robertson Fungicide powder contains 14.7 trillion particles whose total surface amounts to 5,436,000 square centimeters, or about 10,000 times the surface of a pound sphere of copper. The powder is easily dispersed and mixes readily. Its true specific gravity is 7.3 and its bulk density is 20 lbs. per gallon.

•

Western Shade Tree Meet

The Western Chapter of the National Shade Tree Conference was scheduled to be held at the Green Hotel, Pasadena, Calif., May 14-16. The advance program called for a banquet on the 15th and a panel on the 16th, covering "Sprays as used in Pest and Weed Control."

•

"Systox" Okayed on Cotton

Approval for the use of "Systox," a systemic insecticide, for control of cotton pests has been announced by Pittsburgh Agricultural Chemical Co., New York, makers of the material.

"Systox" is the trade name for O,O-diethyl-O-2 (ethyl-mercapto)-ethyl thiophosphate, developed by Gerhard Schrader in Germany, but researched in the United States by Pittsburgh Ag. Chemical Co., and Chemagro, a subsidiary. It is soluble in most organic solvents and in water to about 0.01%. The compound is approximately as toxic to warm blooded animals as parathion, and somewhat more toxic than parathion when exposure takes place through the skin. (However, absorption through the skin appears to be greatly retarded when "Systox" is formulated with emulsifier "42-1A".)

The systemic is said to be compatible with lead arsenate, rotenone, pyrethrum, nicotine sulfate, summer oils, dormant oils, DDT, dieldrin, BHC, chlordane, toxaphene, quinones, fixed coppers, wettable sulfur and aldrin.

It is incompatible with bordeaux, lime, and lime sulfur and of doubtful compatibility with zinc arsenate, calcium arsenate, paris green, cryolite, and organic mercury compounds.

•

Du Pont Bag Coating Resin

E. i. Du Pont De Nemours and Company exhibited a number of interesting new packaging developments based on use of its "Alathon" polythene resin, at the 21st National Packaging Exposition, at Atlantic City, New Jersey, April 1st.

Drums made of paper, coated with "alathon" have been found satisfactory for the shipment of dry chemicals including fertilizer and other materials which could not be transported satisfactorily in metal containers because of corrosion, moisture absorption, and other difficulties. Not yet generally available, but said to show promise on the basis of tests are other "Alathon" treated paper drums designed for transportation and storage of liquids and semi-liquids. Paper, coated with "Alathon" resin, has been used in packages for peat moss and humus that will withstand bacterial attack.

•

Int. Min. Advances Four

Four new appointments in the Plant Food Division of International Minerals and Chemical Corp., Chicago, have been announced by Maurice H. Lockwood, vice-president in charge of the division.

E. Meade Wilson has been appointed an area manager at Mulberry, Fla.; D. N. Barksdale will act as assistant to Mr. Wilson; W. P. Burke, formerly area credit manager in the East Point, Ga. office of the division, has been made district sales manager at Albany, Ga.; S. Ralph Smith, sales representative at East Point, will take the position formerly held by Mr. Burke.

•

AAC Executive Dies

Robert C. Charlton, 54, chief chemist and director of Chemical Control of The American Agricultural Chemical Company, New York, died suddenly March 25, at Elizabeth, N. J.

Mr. Charlton had been associated with American Agricultural for 32 years, having joined the company as chemist at its Baltimore plant in 1920. In 1939 he moved to the company's Carteret, N. J. plant as chemist. In 1942, he came to the company's New York office as Assistant in the Production department, becoming Assistant Manager, Chemical Production, in July 1944, and moving up to Director of Chemical Control in October of the same year.

•

Pacific NW Fert. Meeting

The Pacific Northwest Plant Food Association will meet at Pocatello, Idaho, July 9, 10 and 11, 1952, according to Leon S. Jackson, Portland, Oregon, secretary of the group. Details of the program will be announced later, Mr. Jackson says.

One stir gives you a stable emulsion

Emulsions last longer—disperse faster —with Armour's Etho-chemicals

Armour's oil-soluble, water-dispersible Etho-chemicals solve any emulsification problem faster and easier with a minimum of agitation—and the emulsions last longer. For instance, Ethomeen S/12 and Ethomeen S/15, mildly cationic chemicals which are not affected by water hardness, combine to form an excellent emulsifier for 2,4-D isopropyl ester, even in extremely low concentrations. Another time- and work-saving emulsifier is Ethofat 142/20, a non-ionic chemical for use with kerosene or xylol as a solvent. Chlordane can be emulsified directly into water with this chemical, without the use of a solvent. Write today for complete information about these and Armour's other emulsifiers, including formulas, methods of use, and prices.

ARMOUR CHEMICAL DIVISION
Armour and Company, 1355 W. 31st St., Chicago 9, Ill.

USI Moves N Y Office

U. S. Industrial Chemicals Co. has announced the removal if its office to 120 Broadway, New York 5, N. Y.

N. CENTRAL AAEE

(*Continued from Page 61*)

request the Federal Drug Administration to report its findings on tolerances; and third, that the branch appoint a committee which would consider the pre-publication of abstracts of the reports given at the annual meetings.

The 1953 meeting was announced for March 26th and 27, to be held in St. Louis, Missouri. The nominating committee elected for the following year is as follows: chairman, C. Weinman, Nat. History Survey, Urbana, Illinois; Paul Dahm, Nat. Hist. Survey, Urbana, and A. W. Buzicky, state entomologist, St. Paul, Minn.

The arrangements and preparations for the 1952 meeting were made by the local arrangements committee, consisting of C. E. Mickel, Univ. of Minn., St. Paul, chairman; F. G. Holdaway, Univ. of Minn., St. Paul, and A. W. Buzicky, state entomologist, St. Paul, and by program committee, which consisted of J. H. Bigger, chairman, U.S.D.A., Iowa State College, Ames, Iowa; T. H. Park, extension entomologist of Ohio, Columbus, and T. A. Brindley, U.S.D.A. Iowa State College, Ames, Iowa. The proceedings of the meeting are prepared by R. T. Everly, Purdue, Univ., Lafayette.

SUPPLIERS BULLETINS

(*Continued from Page 89*)

in insecticide sprays. Approved aerosol formulas using "Thanite" are also listed.

The booklet gives technical information on the product as used in livestock sprays, aerosols and in household pest control.

Copies are available from the company, Wilmington, Delaware.

BERMUDA

(*Continued from Page 68*)

the entomologists and at the same time speeded up the deterioration of any cedars weakened by the attack of the scale.

What is the situation in Bermuda today? By the end of 1951, virtually all the cedars in the central and eastern sections of the Island were dead. In places, individual trees and even small groups of trees have retained their green appearance, but the scale can be found on most of these and in many cases deterioration is evident. The picture in the western part of the Colony is somewhat brighter. Here the cedars look somewhat better although many of these trees show dead branches and twigs. Some have lost their vivid green appearance and it is felt that in time these also will die. It is rather difficult to predict with any degree of accuracy just what is going to happen in Southampton and Sandys Parishes.

HLW EMULGATES

ORGANIC LIQUID EMULSIFYING METAL-IN-OIL COMPOUNDS AS

NUTRITIONAL FOLIAGE SPRAYS

TO RESTORE PLANT DEFICIENCIES OF THE MINOR ELEMENTS
MORE RAPIDLY AND EFFECTIVELY THAN ANY OTHER TREATMENT

HLW Emulgates Foliage Spray Concentrates now available

1. **CUPRON** . . . . . Organic Copper
2. **FERRONATE** . . Organic Iron
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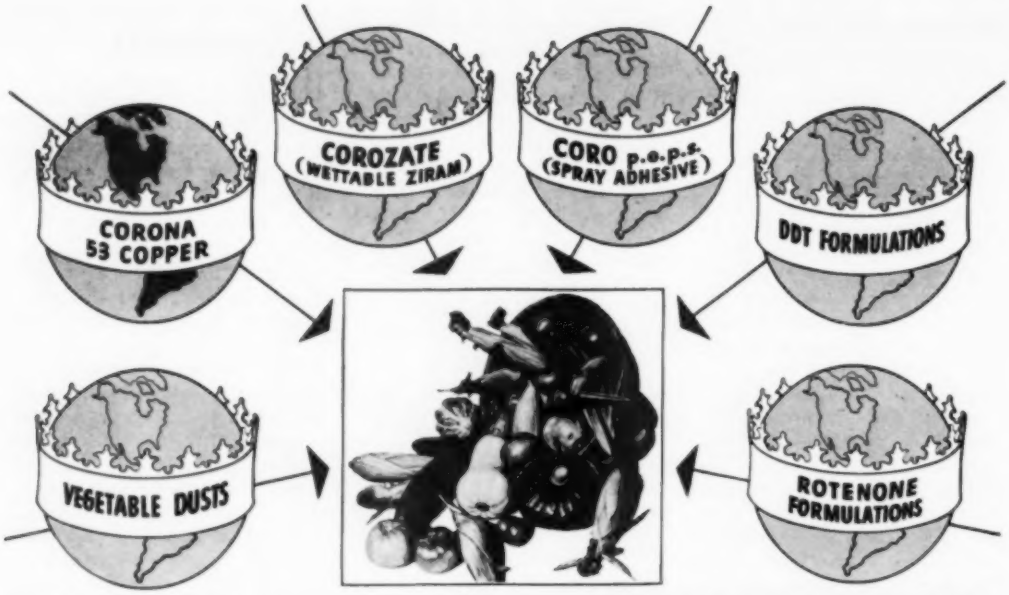
HLW H. L. WOUDHUYSEN & ASSOCIATES DIGBY 4-1857

Factory at Long Branch, N. J. 17 BATTERY PLACE · NEW YORK 4, N. Y.



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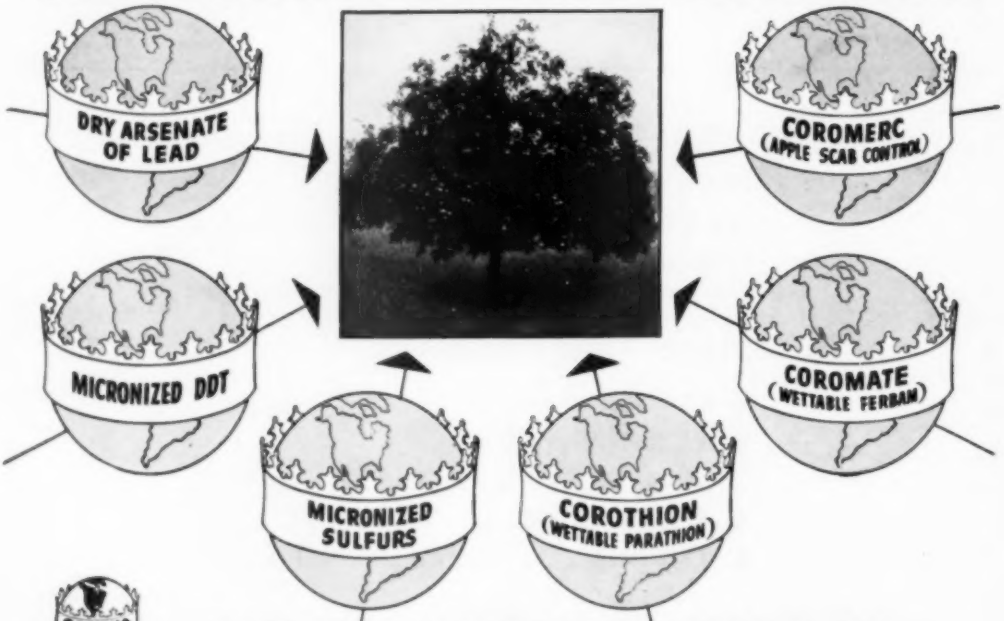


CORONA CHEMICAL DIVISION

PITTSBURGH PLATE GLASS COMPANY

MILWAUKEE, WIS. MOORESTOWN, N. J.

Even in the west, the Juniper Scale can readily be found on nearly every cedar tree. On the other hand, *Lindorus lophanthae* Blaisd., the most effective of the predators, can be shaken from almost every tree and may yet check the spread and development of the scale. The Island, particularly from the air, has lost much of its luxuriant green coloring. It looks more like a northern deciduous forest in the winter time. Even the many smaller Islands surrounding Bermuda are brown and denuded, all of which detracts tremendously from the general appearance of the landscape. According to the most reliable information, approximately 85 percent of the Island's cedars are dead. The remaining 15 percent are showing more or less resistance to scale injury and hope is held that from 5 to 7½ percent of those now remaining may survive.

A comprehensive reforestation scheme is already under way. The Bermuda Government has voted funds to remove the dead cedars along the roadways and replant a fifty-foot strip on either side with suitable trees and shrubs. This will have the effect of screening the background from the eyes of the tourist. In time, all the dead cedars will be removed and the countryside replanted, although this will probably take some years, as the task is an extremely laborious one. The replanting is being planned carefully and carried out by Officers in the Department of Agriculture with a view to insuring suitable mixed stands of trees and shrubs, thus obviating the possibility of a repetition of such wholesale destruction. It is felt that, given a few years, Bermuda will look even greener and more tropical than it ever has in the past and the addition of a variety of flowering shrubs, as is now planned, will greatly brighten and beautify the landscape.★★

•

"Ideal" Okay for Fertilizer

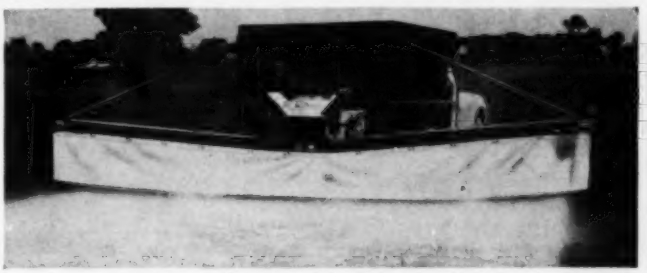
The Milwaukee city sewage commission was recently upheld in their use of the word "ideal" on their fertilizer product "Milorganite." Their usage of the word does not infringe on any copyright held by other fertilizer concerns, according to an opinion by Richard J. O'Melia, an assistant city attorney.

The Wilson & Toomer Fertilizer Co., Jacksonville, Fla., through its attorney Paul D. Boone of Washington, D. C., wrote to the city sewage commission last September charging infringement and demanding that the city stop using the word. The sewage commission has been using the word on their fertilizer bags since 1926, and Wilson & Toomer Co., took no action for 20 years, according to Raymond D. Leary, chief engineer for the commission.

•

Returns to S-D Home Office

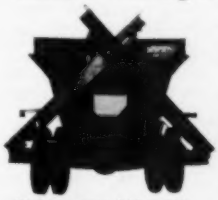
Smith-Douglass Co., Inc., Norfolk, Va., has announced that William B. Copeland, vice-president, who has been in charge of midwest operations with headquarters at Streator, Ill., has returned to the company's home offices at Norfolk where he will participate in the general administration of the company's business.



Why is Hercules

the ONLY spreader that gives uniform distribution?

If you *throw* a handful of fertilizer into a field, the heavy bits naturally go farther than the fine powders—you get *uneven* distribution. You can see for yourself why any "spreader" that *throws* lime and fertilizer *is bound to give uneven distribution.* That's why Hercules uses an entirely different principle to build a spreader that actually *spreads* fertilizer, instead of throwing it. With this exclusive Hercules principle, chain conveyors pull the material across a diagonally-cut distributor plate, so that it drops uniformly at all times.



Discharge arms fold quickly and easily for highway travel.

What's the result? Better crops. More profits. No more soil burn. No spotty concentration of materials. No waste distribution. Lime and fertilizer spread evenly, no matter what the weather, in 20-foot swaths. Gives accurate quantity control from 200 lbs. to 8000 lbs. per acre. Spreads all types of agricultural limes and fertilizers, dry or moist.

Get Hercules— *the only spreader that SPREADS fertilizer instead of throwing it!*

HERCULES STEEL PRODUCTS CORPORATION
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Please send me—

☐ More information on the revolutionary new Hercules Spreader.

☐ Details on how I can get a profitable dealer franchise for the new Hercules Spreader.

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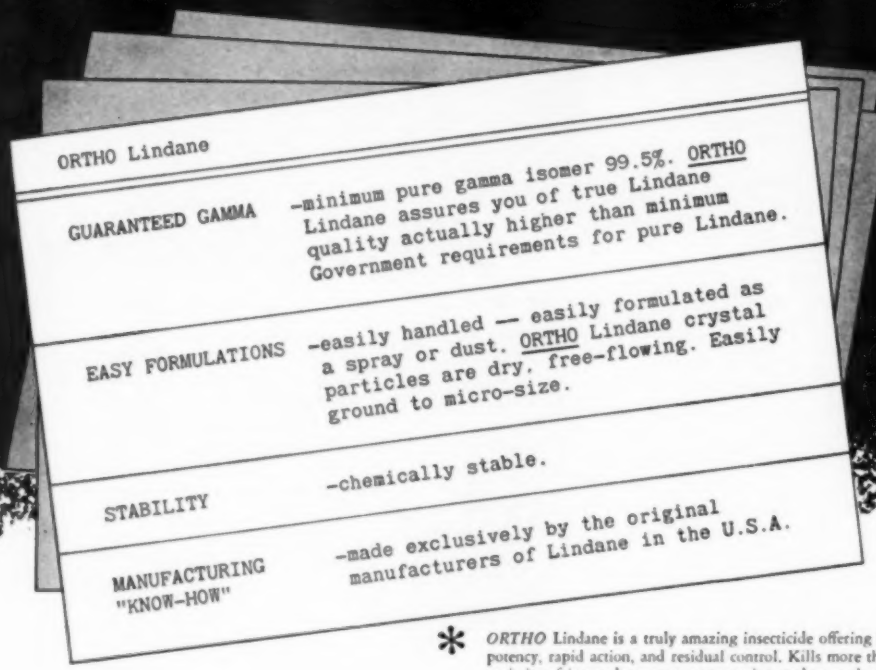
FORMULATORS!
only ORTHO Lindane* gives you all these advantages:



ORTHO Lindane	
GUARANTEED GAMMA	-minimum pure gamma isomer 99.5%. ORTHO Lindane assures you of true Lindane quality actually higher than minimum Government requirements for pure Lindane.
EASY FORMULATIONS	-easily handled — easily formulated as a spray or dust. ORTHO Lindane crystal particles are dry, free-flowing. Easily ground to micro-size.
STABILITY	-chemically stable.
MANUFACTURING "KNOW-HOW"	-made exclusively by the original manufacturers of Lindane in the U.S.A.

* *ORTHO* Lindane is a truly amazing insecticide offering high potency, rapid action, and residual control. Kills more than 200 varieties of insects by contact, vapor action, and stomach poison.

T.M. REG. U.S. PAT. OFF.: ORTHO

always—you profit with ORTHO

For complete information, "Story of Lindane," write:

CALIFORNIA SPRAY-CHEMICAL CORP.

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Home Office: Richmond, California

World leader in scientific pest control

ORTHO

SCIENTIFIC PEST CONTROL

$400,000 Fertilizer Burns

About 6,000 tons of Chilean nitrate of soda, valued at $400,000, was destroyed in a Savannah, Ga. warehouse, fire recently. The fertilizer material was stored in two building owned by the Central of Georgia Railway Co., one of which was destroyed completely, and the other heavily damaged. Total damage was estimated at three-quarter million dollars.

•

Calif. Personnel Changes

Recent personnel changes in fertilizer plants on the Pacific Coast include the following, according to announcements made by the California Fertilizer Association: Carl Davis has been appointed sales manager of the Imperial Fertilizer & Sulphur Co., Los Angeles; John B. Wasson has been named sales manager, Agri-Gypsum, U. S. Gypsum Co., Los Angeles, to replace Ray Van Duesen, recently retired. Naco Fertilizer Co., Santa Clara, has announced the appointment of Ollie Wolcott as assistant to the vice-president of Naco. Taking Mr. Wolcott's place as manager of the Santa Clara plant, is John McGinley.

•

Sulfur Article Featured

"King of Chemicals" is the title of a feature appearing in the March, 1952 issue of *The Lamp*, house magazine published by Standard Oil Co. The article describes the recovery of sulfur from oil and gas, and points out the importance of sulfuric acid in many industries.

RYANIA

(Continued *from Page 73*)

The results of the 1951 experiment are especially important because the insecticide applications were delayed one or two weeks past the time recommended by federal and state agencies for beginning the corn borer control program, and still good control was obtained with ryania, "Ryanexcel" and parathion. In this case it appeared doubtful that corn borer control measures would be necessary and it was late before it was realized that insecticides would be needed. The results indicate that the late applications were well worth the time and expense of application, even though better control would have been expected if two earlier applications had been included in the spray program.

In both years the moth flight started with an accumulation of heat units of 610 to 637 mean-degree-days over 50°F. In 1950, the flight started after 637 units on June 23 and in 1951, after 610 units on June 27.

When the borers were large enough to be observed readily, 20 corn plants were dissected at random in each plot, and the borers were counted. Ten corn plants were dissected at either end of each of the plots and the counts were analysed as 8 sub-plots for each treatment.

(Part II Will Appear Next Month.)

Name ANY Fertilizer Spreading job . . .
there's a
Baughman
specialized body to do it better, easier and give you more profit . . . because
Baughman builds the only COMPLETE LINE
• ALLOY STEEL CONSTRUCTION GIVES MAXIMUM PAYLOAD.
• 13 basic agricultural models, each built to do a better spreading job of materials for which designed.
• Lengths from 9 to 33 ft. (5 to 30 tons capacity) . . . 1 to 6 compartments for selective unloading of different materials.
• Available with single or double spreading distributor.
• Four different gear reductions and drag chain flight spacing . . . this controls volume from a few hundred lbs. to 3 or more tons per acre.
• Complete selection of conveyor bottom widths.
• Controlled volume and spread pattern at any truck speed. Oil-sealed clutch and 3-speed transmission regulate rate of discharge from body . . . velocity of spinner remains in constant ratio to engine speed because of direct drive.
ASK-MS-4
ASK-3W-6
FERTILIZER SPRAYER holds the spread to the ground and makes it stick. Covers up to 4 acres to the mile at 15 miles per hour.
ROCK PHOSPHATE SPREADER ATTACHMENT gives uniform spreads on the level, slopes and hillsides. Designed to prevent materials from packing and crusting.
ASK-3-8
• WRITE FOR FULL INFORMATION & OUR RECOMMENDATIONS
BAUGHMAN
BAUGHMAN MANUFACTURING CO., Inc.
811 SHIPMAN ROAD JERSEYVILLE, ILLINOIS
"There is a Baughman Distributor Near You"

Sturtevant
Granulation Process
Overcomes Fertilizer Storage and Distribution Problems

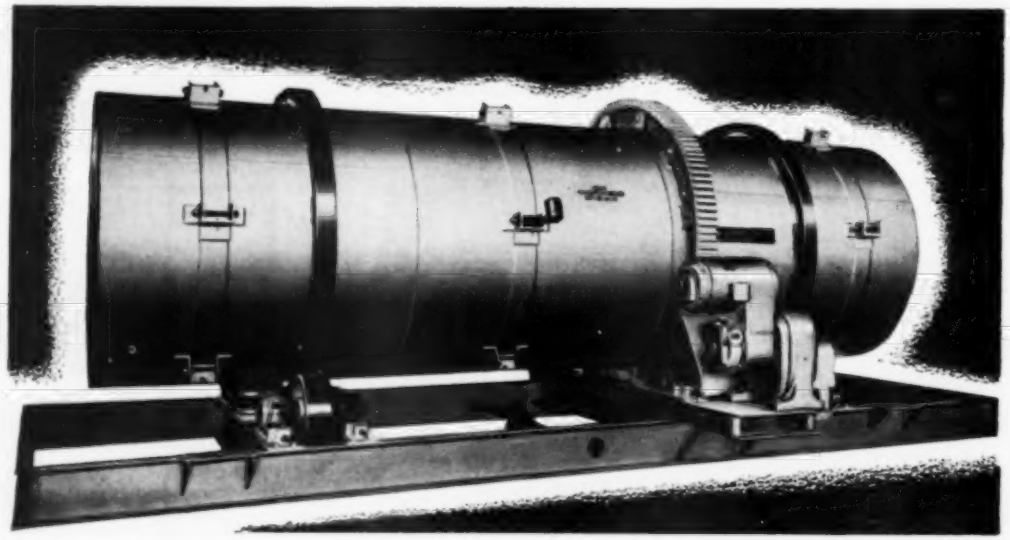
At a recent U. S. D. A. Fertilizer Industry Advisory Committee meeting the following was emphasized in the statement "that year-round movement of fertilizer materials into the using areas for storage should be encouraged as a solution to storage and distribution problems."

Sturtevant fertilizer granulating units can help you provide the solution to the problem. This efficient, economical granulation equipment can be supplied for various hourly tonnages and certain granule sizes, depending on your particular requirements.

If you want to know the important advantages of granular fertilizer, they are — it can be kept in storage bins over longer periods of time without setting up or lumping. Granular fertilizer does not "set" in the bag. It permits shipment direct to users or distributors' warehouses for storage ahead of peak demands.

Write for complete information about the Sturtevant Granulation Process.

STURTEVANT MILL COMPANY
123 CLAYTON STREET • BOSTON 22, MASSACHUSETTS



Gopp Opens Own Office

Len Gopp, formerly with Michigan Chemical Corp., Saint Louis, Michigan, has established his own business under the name of "Philgo Chemical and Products Corp." with headquarters at 1229 Lafayette Building, Detroit, Mich.

The firm will specialize as agricultural chemical manufacturers' agents in the middle west and export markets. Before launching his own firm, Mr. Gopp was for 6½ years with Michigan Chemical as assistant sales maanager.

•

Offers New Solvent

Richfield Oil Corp., Los Angeles, has developed a new low-cost solvent, "Toxisol A", which, it is claimed, will dissolve 35% DDT at 35° C.

•

Baerman to Geigy Co.

Geigy Company, Inc., New York, has announced that Gerald Baerman has become a salesman for the territory including Pennsylvania, New Jersey, Delaware, Maryland and the Delmarva Peninsula.

Mr. Baerman is a graduate of Rutgers University and was formerly with Naco Fertilizer Co. and Shell Chemical Co. before his connection with Geigy. He will operate out of Geigy's New York Office, 89 Barclay Street.

SIDELIGHTS

(Continued from Page 43)

Mountain Copper Co., Ltd., San Francisco, the remainder of the committee included: W. E. Ball, Stauffer Chemical Company, San Francisco; C. E. Cody, California Spray-Chemical Corp., Richmond; E. J. Davis, Los Angeles Chemical Company, Los Angeles; E. T. Doyle, Tobacco By-Products and Chemical Corp., San Francisco; A. J. Flebut, Niagara Chemical Division, Food Machinery & Chemical Corp., Richmond; W. J. F. Francis, Pennsylvania Salt Mfg. Co. of Washington, Tacoma; W. D. Gray, Secretary, Western Agricultural Chemicals Assoc., San Francisco; David T. Prendergast, The Dow Chemical Co., San Francisco; and Edward Schuler, Monsanto Chemical Company, San Francisco.

* * *

The banquet featured entertainment rather than speeches, with a fair portion of the talent drawn from San Francisco's large Chinese and Mexican population. However, good as the professional talent was, probably the best number in the show was put on by the irrepressible Dave Lynch who assisted in performing the Mexican shoe dance. We have it from the inside that all the time Madam Chili Con Carne was smiling and beaming, she was grunting viciously under her breath "get along, wise guy, you bother me. You're lousing up my act."

* * *

Following long standing NACA policy, the business sessions were confined to the mornings on the three days of the meeting, with ample time left free in the afternoons for committee meetings, informal discussions and just plain "shooting the breeze" which latter, incidentally, is probably the principal incentive for many in the industry to attend meetings. But what the business sessions lacked in volume, they more than made up in quality, with such names as Al Boyce, Dr. Freeborn, Joe Cary, Arthur Mohr and others sprinkled among the list of speakers.

* * *

Paul Mayfield, vice-president of NACA, got his baptism of fire when he presided at the opening session, Monday morning. Knowing his reputation as a story teller, there were a few startled gasps when he opened the session with an anecdote about the general manager who later became vice-

Go the scientific way...go **MGK**

AEROSOL INSECTICIDE CONCENTRATES

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You may want complete formulas . . . ready to put right into your aerosol bombs or your retail packages. You may want combinations of insecticides and synergists that leave you only the minimum of processing to do. You may want to do most of the processing yourself and to you we offer the purest toxicants and synergists in their primary forms. MGK has the *best* of whatever you want. The emblem "MGK" is satisfying assurance of high efficiency and scientific production in insecticides and insecticide ingredients. Let this single experienced source help you make better products for less money. For complete information about MGK prices write 1703 Southeast Fifth St., Minneapolis, Minn.

Scarabaeus sacer Sacred beetle of ancient Egypt. Model for carved stone amulets and scarabs.

THE PIONEERS OF PYRETHRUM AND ALLETHRIN

Good insecticides protect America's health and harvest.

McLAUGHLIN GORMLEY KING COMPANY

president, but it proved to be a quite respectable parlor type story, so the amenities were preserved while still starting the meeting off with a good laugh.

* * *

The Hercules group as usual made their trip to the convention on one of the company's D-C 3s, and this time carried as an added starter, a plaster mannequin which served as an incriminating photographic prop in their suite at the Fairmont.

Hercules' San Francisco representative showed up with a polaroid camera, which develops snapshots on the spot, and made some interesting studies for visitors to take home to their wives.

* * *

Pictures of the moving variety were shown by Monsanto who brought with them an advance print of their new film on "Krilium." A number of the convention group took advantage of the opportunity to get a preview of the picture, and to pick up further information about this new soil conditioner which is attracting so much attention throughout the industry.

* * *

Year after year the percentage of ladies attending these NAC meetings grows. And each new lady the publisher of AG Chemicals meets, it seems, accuses him of being responsible for the stack of copies of this publication which her husband insists on accumulating, and refuses to let her discard even during annual spring house cleaning. Our standard answer now is to assure all concerned that they possess an invaluable collection, and as a matter of fact many of the issues, the earlier ones particularly, are now practically collectors items.

* * *

Ed Dobbin of Edco Corp., brought his wife along on the San Francisco trip, and their plans also included visits to Los Angeles, and thence to Mexico City and Acapulco. The occasion was the celebration of their twentieth wedding anniversary, which came during the course of the convention.

●

Davison Names Craven

Appointment of Henry E. Craven, Jr., as manager of the newly organized Lake Charles Division of The Davison Chemical Corporation has been announced by F. C. Nicholson, manager of operations. The new division will operate the large plant which the company is building on the Calcasieu River south of Lake Charles, La., and which will produce petroleum cracking catalysts.

●

Cox to CSC in S. Carolina

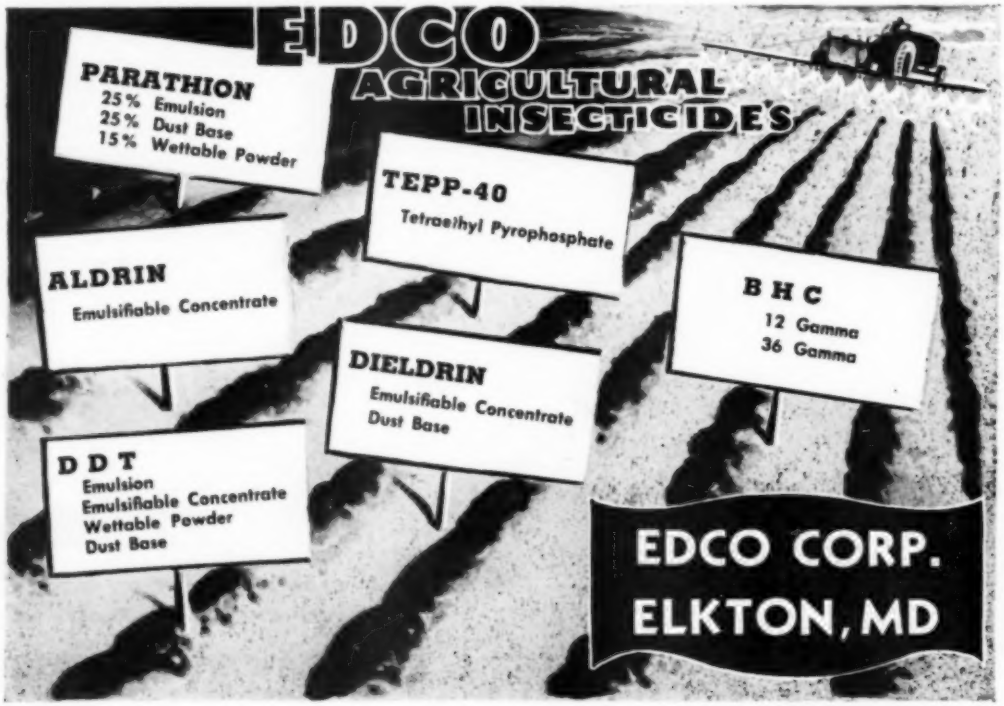
Ralph O. Cox has joined the Animal Nutrition Division of Commercial Solvents Corporation, the company has announced. He will handle sales of the company's antibiotic and vitamin feed supplements in the Southeastern states, making his headquarters at Woodruff, South Carolina.

Mr. Cox recently graduated from Clemson College with a B.S. degree in agriculture.

NAC MEETING

(*Continued from Page 47*)

deputy director of the Office of Materials and Facilities, Production and Marketing Administration, U.S.D.A. He explained in detail the functions of various agencies in the capital, beginning with the Defense Production Administration and the National Production Authority. The chemical division of the latter is the key agency for pesticides, he said. This division's job is to encourage and assist in the production of pesticides. The U.S.D.A. acts as claimant for pesticides needed in the domestic production and distribution of agricultural



commodities. The office of International Trade does the same for exports.

The Department of Agriculture's functions as claimant include two steps: first, making an estimate of the quantity of each pesticide needed for domestic consumption; and second, doing whatever is possible to see that the required materials are available. The latter function usually takes the form of arguing the pesticide case before the NPA, DPA and other agencies and in trying to give all possible assistance to the producers of pesticides. The agencies have been very cooperative in recognizing the need for pesticides and in regarding the industry as an essential one with a high priority.

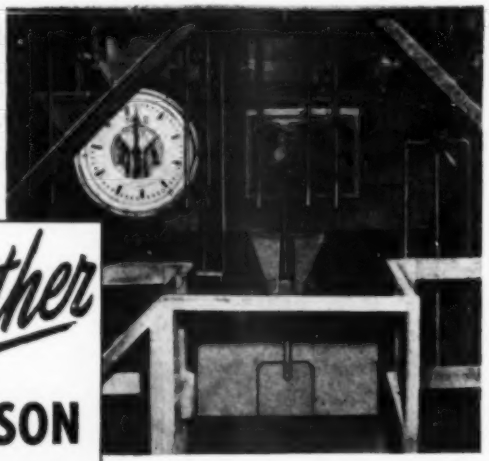
Mr. Allstetter described some of the difficulties involved in arriving at estimates of what requirements for pesticides will be. He said that this is done twice each year. In the early fall, he said, specialists in the Department examine previous year's consumption, try to evaluate trends in use, examine agricultural production goals for the following year, and from this information, arrive at an estimate of the requirements for pesticides for the ensuing year. These estimates are subsequently modified on the basis of information gathered through a nationwide survey sponsored by 51 state and territorial PMA state committees.

Generally speaking, he said, increases in demand for pesticides in 1952 may be lower than the increases occurring between the crop years 1950 and 1951. Total requirements for all pesticides for the 1952 crop years are estimated to be about 9 percent higher than last year, whereas the total requirements for the crop year 1951 were expected to be 25% higher than they were in 1950. This does not mean that the growth of the pesticide industry is retarded, he explained, but rather, that demand for many of the materials which have been established for a relatively long period tends to remain stable, while demands for the newer crop protectors continue to increase. For example, he siad, requirements for the synthetic chlorinated pesticides as a group are estimated to be up an average of 25% as compared to last year. Shortages of copper and sulfur are also reflected in lower estimated demands for pesticides containing these products.

Regarding tax amortization, he said that no certificates are likely unless DPA has set an expansion goal and this goal is not yet satisfied. He gave sulfur as an example of an unsatisfied goal. In this case, a production capacity goal has been set for 8,400,000 tons of sulfur in all forms. However, currently-planned projects indicate a production in 1955 of only 7,100,000 tons in all forms. Thus, the DPA will continue to consider applications for tax amortization for sulfur production.

Nitrogen, on the other hand, is an example of a satisfied production goal. Although a tremendous expansion goal was set up (an increase of over 80% in synthetic nitrogen pro-

Johnson multiple material weigh-batcher, with 5,000-lb. dial head scale, accurately weighs up to 5 (or more) fine-grained materials. Top levers open fill valves from overhead 5 section bin. Lower lever discharges batch into the mixing unit.

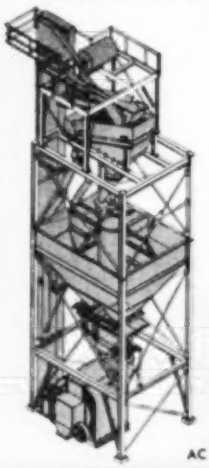


Another
JOHNSON
BLENDING
PLANT
for midwestern fertilizer manufacturer

TO modernize one of its plants, a leading midwestern fertilizer manufacturer installed Johnson elevator, bin and batching equipment . . . gained a 25% increase in production, and, at the same time, substantially reduced manpower requirements. As a result, the fertilizer firm has equipped another one of its manufacturing plants with Johnson blending equipment, shown here.

Here's how this mechanized handling eliminates slow, costly manual methods: In one continuous cycle of operation, material travels up bucket elevator to clod breaker . . . through separating screen into collecting hopper. From hopper, pulverized fertilizer passes through pivoted distributor into 5-section, 65 cu. yd. bin . . . then, to multiple-material weigh-batcher, and into mixing unit for final blending operation.

To check savings possible in your plants, call your Johnson distributor, or write us.



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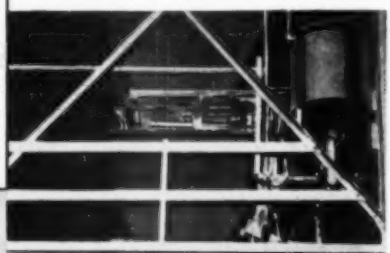
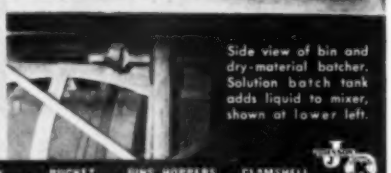


C. S. JOHNSON CO. CHAMPAIGN, ILLINOIS
Send us more information on Johnson fertilizer blending plants.

NAME
TITLE
COMPANY
STREET
CITY
STATE
(ROEHRING SUBSIDIARY) J163



Side view of bin and dry-material batcher. Solution batch tank adds liquid to mixer, shown at lower left.

BULK STORAGE SILOS • AERATION SYSTEMS • SCREW CONVEYORS • BUCKET ELEVATORS • BINS, HOPPERS, BATCHERS • CLAMSHELL BUCKETS

duction from 1951 to 1955) there is now scheduled for construction, either with or without tax amortization assistance, enough capacity to meet the goal. Thus, unless one or more of the applicants defaults on his certificate or unless the goal is revised upward, no further certificates will be issued. Mr. Allstetter added that in his opinion, tax amortization certificates will be increasingly difficult to obtain in the future.

Surplus No Problem

DISCUSSING agricultural production, Mr. Allstetter declared that there is little grounds for fearing an agricultural surplus. Expansion is here to stay, he said, and with population trends pointing ever upward, even greater production will be necessary. For every four people who must be fed today, there will be five in 1975. If we increase at the current annual rate of 2,700,000 for 25 years, we will add 67,000,000 people to our population, which would total some 217,000,000 in 1977. "The increase in population has already put a strain on the nation's ability to provide food and fiber requirements, particularly as our diet has been improving at the same time."

The solution is far more complex than asking farmers to produce more and then expecting them to do it, he said. The situation is unlike any of the past, since we have run out of new land. Increased production, therefore, must come from bigger yields as the result of greater use of pesticides, fertilizers and improved farming methods. The U. S. Department of Agriculture is emphasizing greater yields in its current releases and bulletins, he said. "Nearly every instruction or release regarding food production that goes out from the USDA to field agencies emphasizes the need for using more agricultural chemicals in obtaining our food production goals," he reported.

Pesticide Guestimating" was the unique title of a talk by Dr. G. F. MacLeod, technical vice-president of Sunland Industries, Inc., Fresno, Calif. He pointed out the hazards involved in "Guestimating" in general

terms, and declared that dealers, rather than manufacturers, might be able to present more accurate figures as members of various governmental committees. "This would bring us around again to the crop reporting services as logical sources for estimating needs of all kinds," he said.

All estimates are subject to wide fluctuations and variable factors which make them particularly difficult, he reminded. With this in mind, he declared that one can easily justify an estimate of over 90 million pounds of chemicals on a technical basis being formulated and applied on California crops in 1952. He added that well over three million acres will be treated by airplane during the season.

Tuesday's session, restricted to the NACA and WACA membership, was presided over by Lea S. Hitchner, executive secretary and treasurer of the NAC Association. John D. Conner, Washington, D. C., NAC counsel, discussed product liability; Joseph A. Noone, Washington, D. C., NAC technical adviser spoke on legislation and Dr. L. Gordon Utter, Phelps Dodge Refining Corp., New York, chairman of the NAC Technical Advisory Committee, discussed labeling problems.

Final Session Wednesday

A FULL house greeted speakers and chairman A. W. Mohr at the final session of the meeting on Wednesday. C. B. Moore, managing director of the Western Growers' Association, Los Angeles, scheduled to appear on this program, was unable to be present. First speaker therefore, was Dr. Stanley B. Freeborn, Assistant Dean of the College of Agriculture, University of California, Berkeley, who discussed the relationship of technology and agriculture. He emphasized that many of agriculture's problems such as increased labor costs are man-made, and that "the world's population increases faster than the world's food production in the present ratio of fifteen to nine."

In 1950, he declared, agricultural losses attributable to insects, weeds, and plant and animal diseases totaled some 13 billion dollars. The loss of this production has a total dollar value of 31 billions or 46% of the 1950 gross agricultural production. "Scientists agree that a great part, or all of these losses could be averted by systematic and comprehensive use of insecticides, fungicides, rodenticides and herbicides," he declared.

The Dean said that although agricultural advancement through mechanization has been great, it is being eclipsed by the chemicalization of agriculture. He said that basically, the use of chemicals in agriculture finds its greatest justification in reducing the amount of labor required to produce a given unit of food or fiber. (Dr. Freeborn's paper appears elsewhere in this issue.)

A thorough description of the functions of the California Department of Agriculture was presented by W. C. Jacobsen, Sacramento, assistant to the State's Director of Agriculture. He said that protection and promotion of California's highly diversified agricultural industry through enforcement of appropriate laws, rules

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and regulations has been the basic function of the Department since its beginnings in 1880.

Citing the Department's responsibility to protect California's vast agricultural industry, with an income of slightly more than two and a half billions of dollars in 1951 and giving California first rank nationally, Mr. Jacobsen pointed out that cooperation by the Department with all agencies engaged in related work, to avoid duplication or overlapping of services, has been a fundamental precept of the Department.

"In spite of the fact that people frequently refer to certain provisions of the California Agricultural Code as being the State Department of Agriculture's laws, we have adhered to the policy of recommending that substantive changes in those laws should originate with the industry affected," said Mr. Jacobsen. "Therefore, the primary source of our California agricultural laws is the industries requesting them."

Mr. Jacobsen said another way that changes in the California Code are made, is through discussions and hearings of Legislative Interim Committees later translated into laws; and a third way is by the Department itself through Departmental sponsored legislation.

"These Departmental changes are restricted by policy to correctional matters or to change a law if, in administrative practice, it does not accomplish the result the Legislature intended.

"All regulations of the Department must be printed in the California State Administrative Code."

A rapid-fire report of his recent round-the-world trip was given by Dr. A. M. Boyce, director of the California Citrus Experiment Stations, Riverside. Dr. Boyce sees tremendous need for American "know-how" in many countries where ancient agricultural methods cannot keep pace with food needs. Ignorance, superstition, along with distrust of new ways of farming, plus the belief in some countries that no insect should be killed, have resulted in literal starvation for millions, he reported. Such sub-human conditions in turn create a perfect atmosphere for war and communism, and often start a vicious circle from which it seems virtually impossible for a people to escape.

Dr. Boyce, whose mission was in the interest of entomological research, said that he did not attempt to make a study of politics or religious beliefs of the places visited, but the backward attitudes of so many were so apparent one could not help making note of it. He told of one case in famine-ravaged India, where a native, after receiving a small dole of food, gave his portion to a cow, regarded as sacred. Dr. Boyce said that these animals are allowed to roam at will, eating great quantities of food which could better be used for human consumption.

A difficult problem lies in the fact that cotton is grown in Pakistan, while the textile mills are in India. Since the Moslems and Hindus re-

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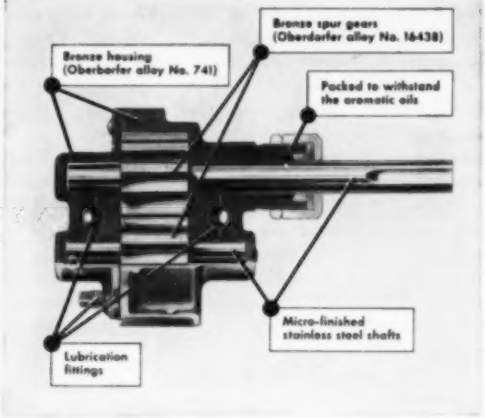
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fuse to trade with each other, an economic stalemate has arisen. As a result, India has had to revamp its agricultural balance by removing from cultivation thousands of acres of rice in order to grow cotton to keep its mills in operation.

He told of locust invasions which stagger the imagination. One swarm, described by natives as a "small" one, was about five miles long by a mile wide. Where ever such a swarm lands, all vegetation is quickly consumed. Measures to control such invasions are not well organized and ineffective, he said. Aldrin was used at first, then abandoned when a number of animals were thought to have died from poisoning.

In Pakistan, the food situation is better, with agriculture moving ahead satisfactorily. Somewhat the same story was told of Israel which should do well, agriculturally, in a few years. Modern methods of pest control are being put to use in Israel, he said, and other good farming practices are being employed.★★

CMU

(*Continued from Page 42*)

up in the spring, 1-2 pounds per acre of CMU will control the annual weeds from 6-10 weeks. If these weeds are allowed to germinate and grow for sometime before treatment is applied, from 5-10 pounds per acre of CMU may be required to eliminate them.

Treatment may be applied to perennial weeds at any time of the year. However, early spring treatment applied before the weeds begin to grow may still be preferred to a fall treatment. It is also desirable to apply CMU when rains may normally be expected shortly after application. If applied during a dry period, little toxic action can be expected until rains fall and carry CMU into the soil.

Selective Weed Control. CMU has looked very promising for the selective control of weeds in crops. This selective action may depend upon one or more of the following factors.

Tolerance. At relatively low rates of application (1-2 pounds per acre) certain crops are tolerant to CMU while most of the annual weeds are not. This is true of spinach, carrots and a number of other crops in which annual weeds are controlled at these low rates.

Placement. In certain large-seeded crops, the seeds are planted in a soil zone below that from which the weeds grow. CMU when applied as a low-dosage pre-emergence treatment to these crops is present in concentrations high enough to be lethal to the germinating weed seed. It is absent or not present in high enough concentrations in the deeper zone around the crop seed to kill the crop plant. This probably is the case in such crops as corn, cotton, and other large-seeded crops.

Combination Tolerance and Placement. A number of crops which grow from perennial rootstocks appear unharmed by rates of CMU

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which will kill annual weeds. This is due in part to the fact that, in general, established plants are more tolerant to CMU than are germinating seeds, and in part to the fact that the root system of perennial plants usually is located much deeper in the soil than is that of the germinating seeds.

Examples of such crops are sugar cane, asparagus, and alfalfa, In fact, one of the most promising fields for the use of CMU as a selective herbicide seems to be that in which the crop is a deep-rooted perennial and the weeds present are mainly of the annual type.

A chemical method has been developed for the detection of very small quantities of CMU in the soil and will be published. Before CMU can be recommended for use in crops it will be necessary to determine more accurately the rates required; the length of time that CMU will persist in the soil; its effects upon treated crops as well as crops that follow in a normal rotation.

Summary

After more than two years of wide scale field and laboratory tests, CMU has been shown to be effective as a soil sterilant at rates of 20 pounds per acre and higher. The material is being widely used for this purpose and testing by state, federal and commercial investigators is being continued.

CMU also appears to have a bright future for use as a selective herbicide in crops that are tolerant to small amounts of the material. When applied as a pre-emergence treatment it has looked promising in sugar cane, cotton, corn, potatoes, asparagus, spinach, flax, pineapple, etc. It also has given favorable results as a post-emergence directed spray in certain of these crops. However, more work will have to be done before the exact place that CMU will fill in selective weed control can be determined.★★

FREEBORN

(*Continued from Page 57*)

of product.

This is another good illustration of my thesis, "nip and tuck." When two hours were required we paid laborers about $2.25 a day and today we pay about $9.00 The proportion is almost perfect, but we are still in business, thanks to research and the progessiveness of the American farmer.

One could go on for hours to detail similar cases in all branches of agriculture, to demonstrate how research has increased production, reduced the necessary man-hours of labor and improved the quality, but these facts are already well-known.

Vast as the strides of mechanization have been, I firmly believe that chemicalization of agriculture is only in its infancy and growing by leaps and bounds. Even its parents in the research laboratories of industry and governmental organizations fail to recognize the possibilities, the capabilities, and the liabilities of their offspring.

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Some of us are impatient and intolerant of the ignorance, blindness, and lack of intelligence which is the background urge that makes movements like that which inspires a Delaney committe or a humus farming magazine. To safeguard intelligent progress, we are forced to spend time, money, energy to counteract these blind spots of ignorance and the will "not to see."

Far better than these concentrated periods of intensive and self-protective campaigns would be a program of well-advertised self-policing that would win the approbation of all intelligent consumers by removing the sources of the half-truths that make these movements mentioned above possible.

I know that no one is more anxious to prevent harmful residues of toxic materials from reaching the dining tables of the nation than the manufacturer who produces them in industry, the scientist who recommends their use, the farmer who applies them, or the retailer or processor who passes them on to the consumer. It is catastrophic to his business if he allows this to happen and he knows it.

If everyone who has a hand in the business feels this way—and I am sure they do—then why is there any problem? Frankly, I don't think there is, but the possibility exists and to allay the growing hysteria in certain quarters, I have some purely personal ideas. Here is a suggested cooperative safety program of distributed responsibilities that should create complete confidence on the part of the consumer.

The manufacturers' responsibility:

To establish effectiveness and method of use.

To establish relative toxicity of product used to plants and animals.

If toxic to human beings, to establish an accurate method of analysis and approximate half-life on food.

The Federal Government's responsibility:

To carry out toxicity tests as a basis for tolerances.

In the case of toxic products, to establish tolerances that are safe on fresh and processed foods.

To police interstate shipments.

State Government's responsibility:

Regulatory.

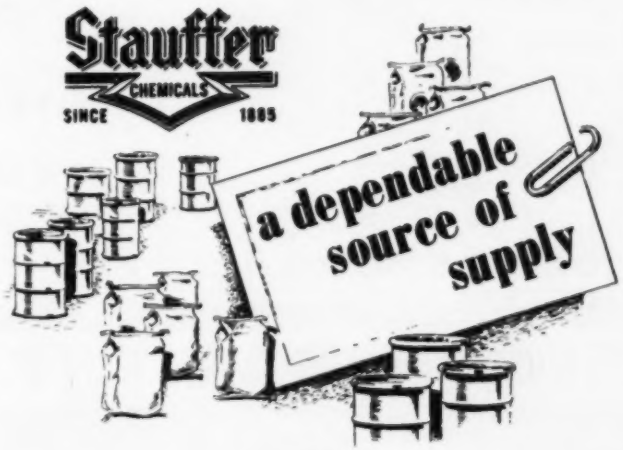
To police intrastate sales for enforcement of tolerances.

To regulate applications of pesticides where necessary.

Research

To adapt materials and methods of application to local conditions and species. (Particularly the Agricultural Experiment Stations)

There are some who believe that the establishment of tolerances creates an impression that all products coming under tolerance are, *ipso facto*, poisonous. I am confident that the reverse would be true. In place of the present feeling of uncertainty and uneasiness there would be as much confidence in the integrity of



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Without tolerances, everyone connected with the field is dealing with uncertainty. The Experiment Stations have reached a point where it is being considered very seriously as to whether or not they should risk liability in making recommendations for the application of pesticides. Our research workers know full well that they can apply certain insecticides in given dilutions, a prescribed number of days before harvest and market a crop that has no possibility of being toxic to the consumer. They cannot be sure, however, that the grower may not have his crop condemned even after he has followed all their directions because it carries a minute trace of the offending chemical that could, by no stretch of the imagination, be harmful. Amply safe tolerances would solve this problem.

I am sure that I have over-simplified the problem by suggesting that the manufacturer should be required to indicate methods of analysis for the determination of residues. People engaged in this work state that fully half their time devoted to testing residues (as part of our recommendations for safe application) is spent in devising methods of detection. A material that can be dipped from a bottle on a spatula and detected with ease becomes exceedingly elusive in a myriad of disguises when it mingles with fruit juice. It may be easily detectable on beans or alfalfa but avoids exposing itself when afforded a hiding place in oily avocado pulp.

The ingenuity and integrity of our analytical chemists both in industry and institutional laboratories inspire great faith. Together they can solve any of these problems even if they have to go to bio-assay to do it. Until they have solved these individual problems, however, we are pouring oil on the fires of fanaticism if we allow chemicals to be applied to foods without an authentic check for their detection for the protection of the ultimate consumer.

The writer made the blanket suggestion that the federal government should "establish tolerances" and "police interstate shipments." The latter duty is, I believe, the proper function of the F. D. A. It is inherently un-American, however, except in the kangaroo courts of the 49ers, for the judge to make his own laws, establish his own penalties or set up his own concept of sin and virtue without the guidance of rules and precedents over which he had no control. For this reason I would advocate that tolerances which are the key to our whole solution of this problem of uncertainty and unrest be entrusted to a separate agency of government charged primarily with research and fact finding. I can think of no more appropriate organization than the United States Public Health Service whose service to the people of these United States for over 160 years has always been characterized by devotion to the goal of man's health and well-being without the slightest hint of bureaucracy or "empire building."

The progress that we may make in American agriculture through the use of chemicals is threatened today by a fanaticism that is being fanned into flame by minor demagogues bolstered by power-hungry governmental bureaucrats. Fanaticism thrives on ignorance and half-truths. Its antidote is truth.

The writer has tried to describe his concepts of the values to agriculture that are present in agricultural chemicals, and has suggested personal opinions as to steps that would be helpful in facilitating their use with safety and economy. Many other ideas or refinements of this concept will be forthcoming, but whatever they are, let us be sure that we have left absolutely no loophole, short of gross negligence, by which the public health may be endangered. An aggressive campaign can then be started to educate the public concerning these safeguards and their effect on the safety and healthfulness of American farm products.★★

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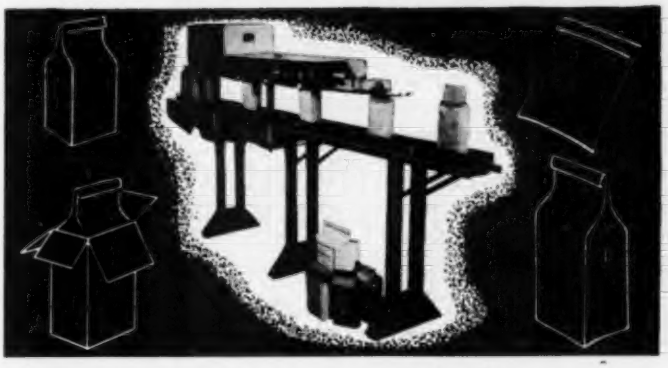

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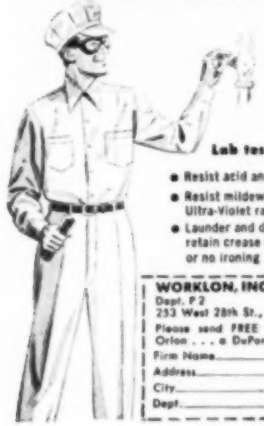

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FLA. FIELD TESTS

(*Continued from Page 79*)

plots treated with weak fungicides, but as the data show, the progress of the late blight on plots treated with good fungicides was much slower. The high inoculum potential in such tests, on account of the number of unprotected plots, makes it more difficult for even the best fungicides to act effectively. The effect of the treatments on yields is shown in Table 2.

Since these data were assembled from several tests that were run concurrently, they cannot be subjected to a proper statistical analysis. However, an indication of their significance can be gained from the fact that in one of the trials where analysis was possible, the least significant difference at the 1 percent point was 8.7 percent for the blight readings. The similar figure for the yields was 49 sacks. A correlation analysis of these same data gave the figure $r = -0.92$, indicating a very high negative relationship between yields and the blight estimates.

The results of trials on peanuts and cucumbers can be cited to illustrate the value of the seed treatment technique for evaluating new fungicides. These trials were made for the Crop Protection Institute to provide CPI with field data on new products which had been tested in their laboratories. The tests involved the comparison of six new chemicals with a standard material on each crop. In the peanut test, the chemicals were used at two dosages. All plots were replicated five times in randomly arranged blocks. The data in Table 3 were obtained approximately one month after planting the trials. The identity of the chemicals in the two trials was not the same.

It should be evident from the data cited that field tests can be of considerable value in evaluating new fungicides. It is not suggested that field testing will eliminate the need for laboratory screening of new chemicals. The tests which can be made in the laboratory or greenhouse will reduce the number of materials that ought to be placed in field trials, and will suggest proper dosages of effective materials. However, some products may pass all tests under the controlled conditions in a laboratory or greenhouse, and still not perform well in the field. Field performance ought to be the criterion upon which a decision to manufacture a new product should rest.

GRASSHOPPERS

(*Continued from Page 52*)

tive as a contact poison. It had a short residual period but gave good results in field tests. Dusts were better than sprays and best results were obtained when temperatures were above 80 degrees F.

Chlordane is almost an old timer in grasshopper control. It is comparable to aldrin when used at higher rates. Competition between

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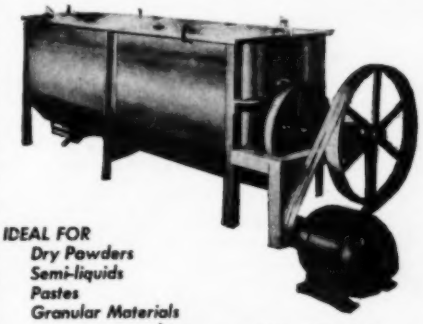

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these materials remains largely a matter of price. Chlordane sprays were superior to dusts. Residual effectiveness of chlordane was a little less than that of aldrin.

Toxaphene has done well in grasshopper control when used at a high rate of application. This has been possible because of its low cost. It had a short residual period and was slow acting. Toxaphene sprays were better than dusts.

Dilan was not tested extensively. It was evident that rather high concentrations would be necessary to obtain good results and this does not appear to be economical at present.

Time of application for any grasshopper toxin is of great importance. The economic species lay their eggs in the soil of fence rows, roadsides, creek beds, ditch banks, pastures, and the margins of fields. In Oklahoma, the nymphs usually hatch from the middle of April to the middle of May, but this is considerably affected by the season. Warm seasons cause early hatching and cold, wet seasons result in late hatching. The period at about the end of hatching is the most favorable time for the application of insecticides. Effectiveness of control is gradually lost as the grasshoppers grow and distribute themselves over wider areas. By the last of June, some of them will be reaching the adult stage. These have wings and may fly great distances, complicating control considerably since many acres may become infested and adults are not so easily killed as nymphs.★★

FUNGICIDES

(*Continued from Page 85*)

lated damped-off seedlings in these *Rhizoctonia* series.

(c) The sterile form showed a slight degree of pathogenicity on Norway spruce and loblolly pine. It was successfully re-isolated from expermentally diseased seedlings of these two species.

(d) The *Fusarium*, *Phoma*, and *Botrytis* isolates appeared to be, at best, only very mildly pathogenic. Of these three isolates, *Fusarium* was re-isolated from diseased Norway spruce and white pine seedlings, none was recovered from loblolly pine and Douglas fir. This is not considered as final proof of the pathogenicity of *Fusarium*, since this fungus was occasionally recovered from dead seedlings in other series.

(e) Owing to poor germination, about 10 percent and subsequent dying of many seedlings in each series, definite conclusions could not be drawn in the case of Douglas fir. It appeared likely, however, that the Rhizoctonia isolates were pathogenic on Douglas fir, since they were consistently recovered in culture from diseased seedlings in the R-1, R-2, and R-3 series. In the case of *Fusarium*, although 72 percent of the seedlings died, the fungus was not re-isolated.

(f) Only the *Rhizoctonia* isolates caused typical root-rot symptoms (data not shown in Table 2).

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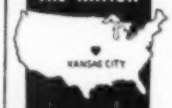

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Roots of loblolly pine were not noticeably affected.

Control

A field experiment was set up April 5, 1950, to study the effect of several soil fumigants on control of the various stages of the disease. Standard nursery beds were divided into 4 x 5 foot plots, each plot receiving one of seven treatments (including a check). The randomized block system was employed with two replications for each treatment. Each plot was divided equally, lengthwise; and one-half was sown to white pine and the other to Norway spruce, both at standard seeding-rates. Data on stands (apparently healthy seedlings) and seedling heights taken May 17, 1951, are shown in Table 3.

It is too early for definite conclusions as to the effectiveness of the various materials against all stages of the disease, but some apparent trends are shown. Chloropicrin appears most promising from the standpoint of both stand and seedling-height. Formaldehyde, also, shows a considerable degree of promise. The beneficial effect of these two materials has apparently lasted throughout the first year. Dichloropropene mixture and ethylene dibromide apparently do not give adequate control. Since these two materials are primarily nematocidal in action, the data would tend to eliminate the action of nematodes as a contributory factor to the damping-off phases of the disease.

To check on the possibility that the browning of needles and death of three-year-old, white-pine seedlings was due, in part, to the prolonged action of summer and winter injuries, one bed of two-year-old white-pine seedlings was covered with laths during July and August, 1950, and again during the four-month period from December 1, 1950, through March 31, 1951. The laths were so arranged that the plant beds received approximately 50 percent of the available sunlight. The bed was compared on August 31, 1950, and again on March 31, 1951, with an adjacent uncovered bed. Plants in the covered bed exhibited, in general, a much greener foliage than those in the uncovered bed on both dates. Also, necrosis of the needle tips was less pronounced in the covered bed.

Another interesting observation was made on May 25, 1951. Growth of new shoots in the covered bed was proceeding at about twice the rate noted in the uncovered bed. This difference in growth-rate resulted in a marked difference in average seedling-height of the two beds. This phenomenon appears to be associated with the effect of the laths in reducing the intensity of direct sunlight reaching the plants, thus preventing extreme discrepancies between water-absorption and transpiration. The cumulative effect of laths in summer and winter would appear to be that of a reduction of needle-necrosis due to desiccation. This, in turn, would ensure a more vigorous plant.

The results suggest the value of proper soil-treatment, coupled with adequate precautions against heat, cold, and drought-injury to the seedlings, as a control program for the disease-complex during the three-year period of growth in the seedbed.

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New Regulations in Ark.

The Arkansas State Plant Board has recently announced adoption of revised regulations governing the sale and use of 2,4-D and 2,4,5-T.

Use of 2,4-D in particular, has been a subject of heated controversy between Arkansas rice and cotton farmers for some time, with the latter group claiming that spraying of rice fields with the material has damaged nearby cotton. Numerous lawsuits in local courts have resulted from specific claims.

Principal changes in the regultions, Chief Inspector Paul H. Millar said, relate to airplane operation in spraying. Custom sprayers applying for permits will be screened more closely in future, and no custom sprayer with a record of careless operation will receive permission to operate, he said. Pilots must be authorized by the State Board to operate airplanes in spraying procedure.

Mr. Miller also said that fields to be sprayed must be at least one and one-half miles in every direction from cotton or other broad-leaved crops highly susceptible to compounds of this type. The only exceptions will be in cases where permission to spray has been given by the owner of the susceptible crop. The distance may be increased if deemed advisable by Plant Board inspectors.

Notification of intention to spray must be given at least one week in advance by publication in the principal county newspaper and by posting notices in the County Agent's office. Former regulations required no notice of intention to spray.

The 1951 legislature authorized the Plant Board to control use of hormone-type herbicides, and several hearings were held by the full Board in an effort to establish regulations satisfactory to groups in various types of agriculture.

•

New Hough Agency

The Meili-Blumberg Corporation of New Holstein, Wisconsin, has completed negotiations with The Frank G. Hough Co. for the acquisition of its line of tractor sweepers.

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TALE ENDS

AN article, "Common Sense about Chemicals in Foods," appearing in the Spring, 1952, issue of *Progress Through Research*, published by General Mills, Inc., contains some thought that the public would do well to ponder.

It comments on the general apprehension felt by the public on the matter of chemicals in foods, and reminds that even foods themselves, are chemicals. While voicing fear of chemical additives, many eaters blithely add salt (NaCl) to their food and put vinegar (dilute acetic acid) on vegetables.

"Still other types of chemicals; insecticides, fungicides and fertilizers, are literally making possible many of our foods," the article says. It then goes on to quote Dr. F. C. Bishopp that "The fruits and vegetables now reaching the consumer . . . are available by virtue of carefully planned and executed control of insect pests and plant diseases through the use of insecticides and fungicides." The use of fertilizers is also upheld. "Commercial fertilizers . . . have become agricultural necessities," the article says. "Today, they are said to be responsible for more than 20% of the farm production of this country."

It points out that the food industry is very cautious in using all chemicals. As business men, they spend millions to establish products with consumers, and realize that any incident which casts doubt on the safety of a given product can destroy the effect of those dollars.

Since 1909, food production on farms has increased about 76%, and chemicals have played an increasingly prominent part.

•

A housewife in Corinth, Mississippi, is reported to have made a slight mistake in caring for her vegetable garden. Instead of fertilizer, she applied the contents of a bag of cement. A concrete example of misuse, of course.

•

Sanitary standards in Brazil are apparently pretty lax, judging from reports to the effect that 300 persons near Sao Paulo were stricken recently after eating contaminated bread. It seems that trucks used for hauling flour had previously transported quantities of arsenical insecticides . . . and someone hadn't bothered to consider the potential danger.

•

Art Bronson, author of the "letter to the editor" appearing in the April issue, says he has received a considerable amount of kidding about the new "herbicide" containing 100% inactive ingredients, as described in his communication. He says that despite his signing himself "manager" of the "Harvacide Corporation" in the letter, he is actually still manager of Specialty Products Sales of Richfield Oil Corp. of California.

To The Front...

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NO. 1
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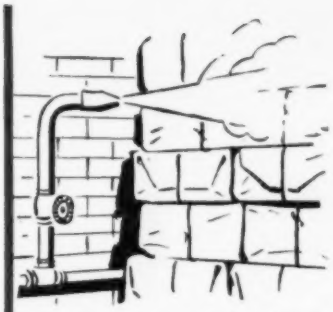
ON HOW TO

Stretch a MULTIWALL Paper Bag

It is just good business to get the best possible use from your multiwalls. Here is one way to do it . . .

Keep Storage Rooms Humid:

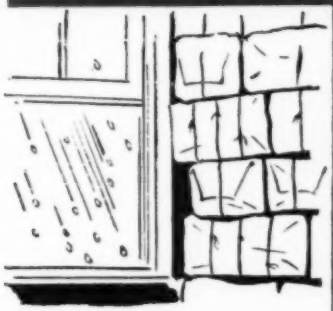


1. Let steam escape in bag storage room to keep air and bags humid. Keep a humidity indicator in the storage room and check it frequently. Always leave aisles or spaces between stacks of bags to allow circulation.

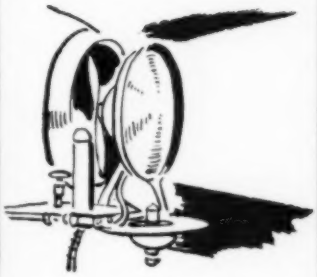
2. Store bags on dunnage, away from floor, and keep floor wet so moisture can be absorbed into air. A relative humidity of about 50% at warm temperature is best.

3. Drill small "needle" holes in horizontal water pipes. Hang cloths over holes. Air absorbs moisture from wet cloths.

4. Hang wet cloths over edge of water barrels. Cloth absorbs water and air absorbs moisture from cloth. Keep barrels well filled.



5. Open windows on damp or rainy day. Damp outside air will circulate in the bag storage room. Multiwalls are strongest when moisture content of the paper is about 6 or 7%.



6. Use commercial humidifying apparatus. Many types of commercial humidifiers are available with capacities to suit individual requirements.

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• • •

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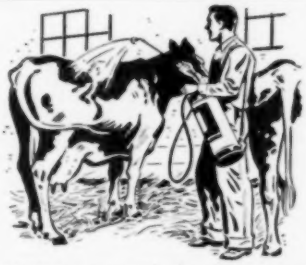
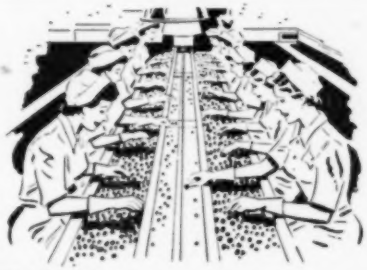


ON THE FARM — Insecticides based on Pyrenone gain in preference because of this unusual combination of important features: Pyrenone protected crops can be used as feed; Pyrenone sprays can be used in dairy premises and on dairy animals without toxic hazards; properly formulated and applied Pyrenone presents no hazard to spray operators, farm employees, animals or to milk and milk products or to grain and grain products. Yet it is effective on *all* species of flies, mosquitoes, and gnats, including hard-to-kill horseflies.

IN STORAGE — Pest control products based on Pyrenone give quick knockdown and kill of a wide range of storage insects, without problems from residues. A wide variety of Pyrenone insecticides are available — aerosols, emulsifiable sprays, dusts. In addition to Pyrenone products formulated by many manufacturers, U. S. I. also offers the agricultural chemical industry two specialized products for protection of stored grains before processing — Pyrenone* Grain Protectant and Pyrenone* Wheat Protectant.



IN PROCESSING — Food plants, bakeries, mills and other similar operations need effective pest control with fast-killing insecticides, yet with no toxic hazards to operators, employees or the products. That's why many pest control formulations for these industries are based on Pyrenone. Many specialized insecticides such as anti-skipper compounds, box car sprays and others are based on Pyrenone.

IN THE HOME — Aerosols, pet shampoos, roach powders, space sprays and a number of other pest control products for the home are formulated with Pyrenone because of its unique combination of fast-acting effectiveness, economical results and freedom from toxic hazards.

Write for details on using the Pyrenone trademark on your insecticide products.

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